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NOTES ON MEULEN'S CATALYTIC METHOD FOR THE DETERMINATION OF NITROGEN IN ORGANIC COMPOUNDS

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TWO TEXT FIGURES

Recently certain new preparations were made in the laboratory of the University of the Philippines and, in order to check the formulas of these compounds, we endeavored to determine the nitrogen content. We found the Dumas method to be rather unsatisfactory. We then tried Meulen's [1] method and obtained very good results. In using this method for determining nitrogen we encountered difficulties with certain compounds but, by adopting a procedure somewhat different from that described by Meulen, we succeeded in obtaining good results. That author's method appears to be an excellent one and we thought it might, perhaps, be of interest to describe in detail the procedure we used.

Meulen's method consists in heating the organic compound containing nitrogen in a current of hydrogen and passing the resulting gases over a nickel catalyst. Under these conditions the nitrogen of the organic compound is converted into am-

[1] Recueil des travaux chimiques des pays-bas 43 (1924) 643.

monia, which can be determined by titration with an acid. Meulen determined the nitrogen content of various classes of ring organic compounds and found that the percentage of nitrogen determined by his method agreed very closely with the theoretical nitrogen content of those compounds.

Some years ago Brill and Agcaoili [2] pointed out certain additional limitations of the Kjeldahl method. According to these authors, when the nitrogen content of compounds such as pyridine, piperidine, quinoline, and isoquinoline is determined by the Kjeldahl method, the results are considerably lower than the theoretical nitrogen content of those substances. They believed that the low results were due to the formation of sulphonic acid derivatives and their resistance to decomposition. We have used Meulen's method to determine the nitrogen content of some of the compounds which appear to resist decomposition, and the results obtained were very satisfactory.

EXPERIMENTAL PROCEDURE

Our experimental procedure for Meulen's method was, in general, very similar to the procedure used by Meulen. The organic nitrogen compound was heated in a current of hydrogen. The resulting gases were passed over a nickel catalyst. The ammonia thus formed was conducted into a standard acid solution containing methyl red indicator and the excess acid determined by titration with standard alkali.

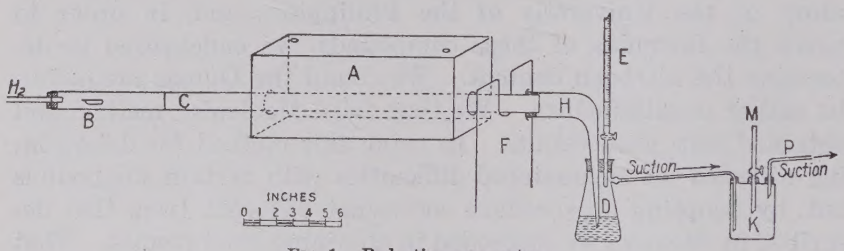


FIG. 1. Reduction apparatus.

Apparatus.—In performing our reduction experiments we used a transparent quartz combustion tube (length 67.5 centimeters) which was placed in an ordinary combustion furnace (fig. 1). The portion of the combustion tube which contained most of the catalyst was inclosed in an asbestos box *A*, which was 30.5 centimeters long, 12.7 centimeters high, and 10 centimeters wide. The bottom of the asbestos box was perforated

[2] Philip Journ. Sci. § A 12 (1917) 261.

with large holes so that the combustion tube that passed through the box could be heated readily. The substance to be analyzed was placed in the porcelain boat *B*. That part of the combustion tube outside the asbestos box and indicated by *C* contained a mixture of reduced catalyst and long-fiber asbestos inclosed between asbestos plugs. *D* is a suction flask containing distilled water acidified with standard sulphuric acid (0.05 *N*), to which were added ten drops of a 1 per cent alcoholic solution of methyl red indicator. The burette *E* contained a 0.05 *N* solution of sulphuric acid. The asbestos board *F* was placed between the asbestos box in the furnace and the suction flask *D*, in order to keep the heat of the furnace from the acid solution in the suction flask.

Hydrogen.—The hydrogen gas was prepared by treating chemically pure zinc with dilute sulphuric acid. The gas was purified by passing through a Drechsel wash bottle containing dilute potassium hydroxide solution, and through another containing fairly concentrated potassium permanganate solution, after which it was passed through four cylinders containing anhydrous, granular calcium chloride, and finally into the transparent quartz combustion tube containing the reduced catalyst and the substance to be analyzed.

Catalyst.—In preparing the catalyst we used the procedure employed by West and Gonzaga [3] in making a catalyst for the hydrogenation of Philippine oils. Before reduction, the catalyst consisted of a mixture of precipitated nickel carbonate and infusorial earth. It was prepared by dissolving 400 grams of recrystallized nickel nitrate in water and adding 90 grams of infusorial earth, after which a solution containing 180 grams of powdered sodium carbonate was added. The mixture was stirred thoroughly and filtered. The residue was washed thoroughly until free from carbonate, spread out on a porous plate, and heated in an electric oven at a temperature of 80° C. until dry, after which the dried material was powdered and kept in a glass-stoppered bottle until ready for use. Since the composition of precipitated nickel carbonate varies somewhat according to the method of preparation, and usually a portion is lost in manipulation, the exact nickel content of the catalyst was ascertained by analysis.

The catalyst was analyzed by decomposing it with hydrochloric acid, evaporating, and dehydrating the soluble silicates, after

[3] Philip. Journ. Sci. 23 (1923) 279.

which these were eliminated by filtration. The nickel was then precipitated as hydroxide with sodium hydroxide solution in a large platinum dish, and weighed as oxide. The nickel content of the catalyst prepared for this work was approximately 23 per cent.

Before using the catalyst for the analysis of organic nitrogen compounds it was mixed with long-fiber asbestos, placed in the transparent quartz combustion tube, and reduced in a current of hydrogen. We found it advisable to place the catalyst in the tube in sections separated by asbestos plugs. In fig. 2 is given a diagram showing how the catalyst was placed in the combus-

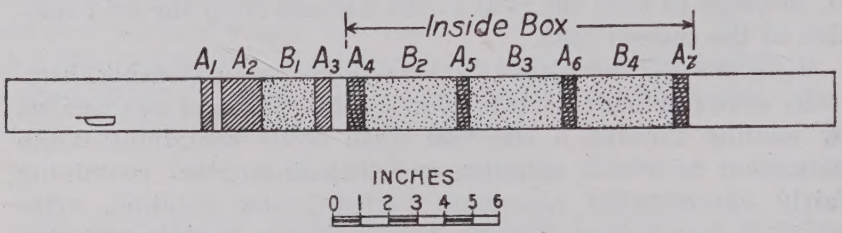


FIG. 2. Diagram showing how catalyst was placed in combustion tube.

tion tube. The letters A_1, A_2, etc., represent asbestos plugs; the letters B_1, B_2, etc., represent a mixture of catalyst and long-fiber asbestos. The lengths of these sections of asbestos and catalyst were approximately as shown in Table 1.

TABLE 1.—*Lengths of sections of asbestos and catalyst.*

Section.	cm.	Section.	cm.
A_1	1.2	A_7	2.5
A_2	3.7	B_1	5.1
A_3	2.5	B_2	7.7
A_4	2.5	B_3	7.7
A_5	1.2	B_4	7.7
A_6	1.2		

After placing the catalyst in the combustion tube one end of the tube was connected to the hydrogen apparatus (fig. 1) and the other end, which passed through the asbestos box, was connected to a suction pump. Purified hydrogen gas was then passed through the tube until all the air was expelled. While the hydrogen continued to pass through the tube, that part of the combustion tube that contained no catalyst and which is indicated in the diagram by the space between *B* and *C* (fig. 1) was then gradually heated to a temperature of low redness. As the hot hydrogen gas passed through the tube the catalyst was

gradually reduced. After passing the hot gas about twenty minutes the remaining portion of the tube containing the catalyst was gradually heated to a temperature of about 350° C. The reduction was continued at this temperature until no more moisture was given off from the catalyst, and the reduction completed.

Analysis.—In analyzing organic nitrogen compounds by Meulen's method the apparatus was arranged as shown in fig. 1. The porcelain boat *B* contained a weighed quantity of the substance to be analyzed. The combustion tube containing the reduced catalyst was connected to the flask *D*. A few drops of standard sulphuric acid (0.05 *N*) was dropped from the burette *E* into the distilled water in the flask *D*, so that the solution gave a distinctly acid reaction as shown by the indicator, methyl red. The empty Woulff's bottle *K* was then disconnected from the flask D, and hydrogen gas allowed to flow through the apparatus until a sample of gas withdrawn from the side tube of the flask *D* showed, when tested, that all the air was expelled from the apparatus. The Woulff's bottle *K* was again connected to the flask *D*, and the outlet *P* of the Woulff's bottle connected to a water suction pump. The tube *M* was used as a regulator and served to produce only a gentle suction. While hydrogen continued to flow through the apparatus, that part of the combustion tube containing the catalyst, both inside and outside the asbestos box, was heated to a temperature of about 350° C. The part of the tube containing the catalyst outside the asbestos box (indicated by *C*) was then covered with porcelain tiles and the temperature increased until this portion of the tube was heated to low redness. The purpose of heating this part of the tube in this manner was to make a preheater of this section. A small flame was then placed between the hydrogen inlet and the boat *B*, in order to keep the substance to be analyzed from volatilizing back of the boat near the hydrogen inlet where there was no heat to decompose any material in this part of the tube. During the reduction the acid in the burette *E* was allowed to drop at intervals into the flask *D*, so that the solution in the flask always showed a decided acid reaction. After about twenty minutes the compound usually was completely decomposed. A flame was then placed under the porcelain boat *B*, and the flow of hydrogen through the apparatus increased for a few minutes to insure complete absorption of the ammonia by the acid solution in flask *D*. The flames under the combustion tube were then extinguished and, after waiting about five minutes for the

tube to cool somewhat, the top of the asbestos box was removed as were also the porcelain tiles that covered a part of the tube. After an interval of about fifteen minutes the tube had cooled sufficiently to allow removal of the flask *D* and the connecting tube *H*. The warm combustion tube was then connected to a suction pump and the flow of hydrogen continued until the tube had cooled to room temperature. The flow of hydrogen was then discontinued, the tube disconnected from the suction pump, and a stopper placed in the end of the tube. The excess acid in the suction flask *D* was then determined by titration with standard sodium hydroxide solution.

In using Meulen's method we found that certain compounds have a tendency to distill through the tube and are not decomposed completely. The nitrogen content thus determined is lower than it should be. By using the portion of the tube *C* as a preheater the compound is cracked in passing through this hot section and all the nitrogen liberated.

In working with liquids or solid compounds that have a tendency to distill through the combustion tube the various asbestos plugs we used proved advantageous in that they tended to retard the progress of the substance in passing through the tube. This seems to be especially true of the plugs A_2 and A_3, in the very hot preheater section of the tube. The passage of the volatile substance through these plugs and the mixture of catalyst and asbestos fiber placed between the plugs was retarded sufficiently for the substance to be cracked and decomposed completely. If the compound is decomposed before entering the part of the tube inclosed in the asbestos box then the nitrogen of the compound combines readily with hydrogen, in the presence of the catalyst, to form ammonia.

EXPERIMENTAL RESULTS

In Table 2 is given a list of the compounds we analyzed. The three toluides of chaulmoogric acid were analyzed by the method of Dumas and the results obtained were very unsatisfactory. When analyzed by Meulen's method these crystalline substances melted and were only partially decomposed. A portion of each of the compounds distilled through the tube, and the percentage of nitrogen obtained was considerably lower than the theoretical nitrogen content of these substances. Analysis by our

modification of Meulen's method, using a part of the tube as a preheater, gave fairly good results.

TABLE 2.—*Nitrogen determined by a modification of Meulen's method.*

Compound.	Nitrogen content.	
	Found.	Theoretical.
	Per cent.	*Per cent.*
Anilide of chaulmoogric acid	3.70 3.86	3.89
Orthotoluide of chaulmoogric acid	3.67 3.77	3.79
Metatoluide of chaulmoogric acid	3.89 3.76	3.79
Paratoluide of chaulmoogric acid	3.68 3.63	3.79
Amide of chaulmoogric acid	5.08 5.01	5.02
Pyridine	17.71 17.65	17.71
Piperidine	16.52 16.47	16.45
Quinoline	10.84 10.80	10.85
Isoquinoline	10.81 10.85	10.85

The compounds pyridine, piperidine, quinoline, and isoquinoline were analyzed for nitrogen by Brill and Agcaoili, who used the Kjeldahl method, and the results obtained were low. Our modification of Meulen's method gave very satisfactory results.

In analyzing compounds like quinoline, which contain a high percentage of carbon, a considerable amount of carbon is deposited on the side of the tube and also on the catalyst when the analysis is completed. After two analyses such as this we found it advisable to clean the tube and put in a new charge of catalyst because the carbon seemed to retard the activity of the catalyst for subsequent analyses.

When the entire apparatus has been arranged and the catalyst reduced, the time required for an analysis is about one hour.

According to Meulen the substance to be analyzed should be placed in the porcelain boat and mixed with powdered metallic nickel. Our experiments indicated, however, that mixing the substance with nickel seems to be necessary only in the case of solid compounds and not with liquids.

Meulen used methyl orange as an indicator. We found that methyl red, which is a somewhat more sensitive indicator, seemed to give more accurate results.

In using Meulen's method it is preferable to use a small quantity of the sample (less than 0.1 gram) for the analysis. A larger quantity deposits too much carbon in the tube and, after a few analyses, the catalyst becomes ineffective and must be replaced by a new charge.

TABLE 3.—*Protein content of stock "feed."*

Sample No.	Material.	Protein content.	
		Modified Meulen method.	Kjeldahl method.
		Per cent.	*Per cent.*
1	Barri grass	9.32	9.15
2	do	7.02	6.74
3	Alfalfa hay	7.60	7.43
4	Rice hay	9.19	9.01
5	Wheat hay	8.20	8.11

In addition to the analysis of pure compounds we also analyzed a few natural products, such as grass and hay, in order to compare the results obtained by our modification of Meulen's method with those by the Kjeldahl method for such products. The results obtained were calculated as protein ($6.25 \times N$) on the dry basis. The rice hay and both of the grasses used were Philippine products and the alfalfa and wheat hay were American products. As shown by the data given in Table 3, our modification of Meulen's method appears to serve as an excellent check on the Kjeldahl method for natural products as well as for pure compounds.

Analysis of the barri grass sample 1 showed that it contained 1.33 per cent chlorine calculated on the dry basis. Since chlorides retard the activity of the catalyst, these natural products were analyzed for nitrogen by placing a short layer (3 centimeters) of soda lime in the combustion tube just before the preheater section, and another short layer (2 centimeters) after the section inclosed in the asbestos box. After the reduction the material remained in the porcelain boat as a charred mass. We found it advisable to clean the tube and replace the catalyst with a new charge after each analysis of substances containing halogens.

SUMMARY

A modification of Meulen's catalytic method for the determination of nitrogen in organic compounds has been described. This modification consists in separating in sections, by means of asbestos plugs, the mixture of catalyst and asbestos fiber. The essential feature of this modification is the preheater section of the combustion tube. The preheater serves to crack volatile organic compounds, so that all the nitrogen is liberated before entering the catalyst in the section of the tube inclosed in the asbestos chamber.

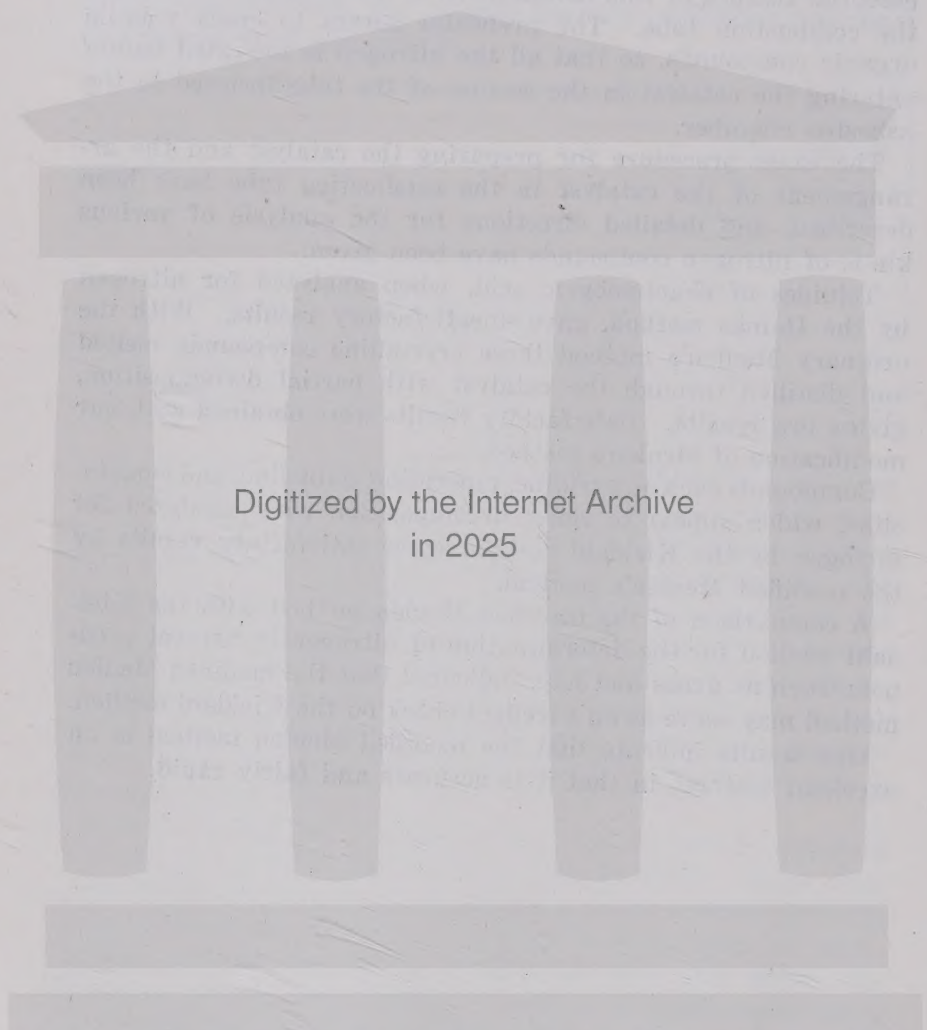
The exact procedure for preparing the catalyst and the arrangement of the catalyst in the combustion tube have been described, and detailed directions for the analysis of various kinds of nitrogen compounds have been given.

Toluides of chaulmoogric acid, when analyzed for nitrogen by the Dumas method, gave unsatisfactory results. With the ordinary Meulen's method these crystalline compounds melted and distilled through the catalyst with partial decomposition, giving low results. Satisfactory results were obtained with our modification of Meulen's method.

Compounds such as pyridine, piperidine, quinoline, and isoquinoline, which appear to resist decomposition when analyzed for nitrogen by the Kjeldahl method, gave satisfactory results by the modified Meulen's method.

A comparison of the modified Meulen method with the Kjeldahl method for the determination of nitrogen in natural products, such as grass and hay, indicated that the modified Meulen method may serve as an excellent check on the Kjeldahl method.

Our results indicate that the modified Meulen method is an excellent method, in that it is accurate and fairly rapid.



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ILLUSTRATIONS

TEXT FIGURES

FIG. 1. Reduction apparatus.
2. Diagram showing how catalyst was placed in the combustion tube.
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CONTRIBUTIONS TO THE BRYOLOGICAL FLORA OF THE PHILIPPINES, VI [1]

By V. F. Brotherus
Of Helsingfors, Finland

DICRANACEÆ

Genus **TREMATODON** Michx.

Trematodon acutus C. Müll.

Luzon, Batangas Province, Taal Volcano, *Bur. Sci. 27249 Ramos.*

Area: Java.

Trematodon drepanellus Besch.

Luzon, Bontoc Subprovince, Mount Polis, *Bur. Sci. 38234 Ramos and Edaño.*

Genus **WILSONIELLA** C. Müll.

Wilsoniella acutifolia Broth.

Luzon, Tayabas Province, Mount Binuang, *Bur. Sci. 28740 Ramos and Edaño:* Ilocos Norte Province, *Bur. Sci. 33393 Ramos.*

Genus **DICRANELLA** Schimp.

Dicranella coarctata (C. Müll.) Bryol. jav.

Luzon, Bontoc Subprovince, Mount Cagua, *Bur. Sci. 38232 Ramos and Edaño.*

Genus **CAMPYLOPUS** Brid.

Campylopus foxworthyi Broth.

Luzon, Benguet Subprovince, Pauai, about 2,300 meters, *Bur. Sci. 32066 Santos.*

Genus **THYSANOMITRIUM** Schwaegr.

Thysanomitrium blumii (Doz. et Molk.) Broth.

Luzon, Rizal Province, Mount Susong-Dalaga, *Bur. Sci. 29447 Ramos:* Bontoc Subprovince, Mount Pukis, *Bur. Sci. 38264*

[1] The geographic distribution is not indicated in the present paper for the species that were included in parts I to V.

Ramos and Edaño. MINDANAO, Bukidnon Subprovince, Mount Lipa, *Bur. Sci. 37168 Ramos and Edaño.*

Thysanomitrium subexasperatum (C. Müll.) Broth.

LUZON, Bontoc Subprovince, Mount Polis, *Bur. Sci. 38235, 38236 Ramos and Edaño;* Mount Pukis, *Bur. Sci. 38263 Ramos and Edaño.*

Genus **DICRANODONTIUM** Bryol. eur.

Dicranodontium nitidum (Doz. et Molk.) Fleisch.

MINDANAO, Bukidnon Subprovince, Mount Lipa, *Bur. Sci. 37165 Ramos and Edaño.*

Dicranodontium brachydictyon sp. nov.

Robustiusculum, cæspitosum, cæspitibus densiusculis, lutescenti-fuscescentibus, nitidiusculis. Caulis erectus, ad 8 cm altus, fusco-tomentosus, dense foliosus, dichotome ramosus vel simplex. Folia erecto-patentia vel indistincte falcatula, canaliculato-concava, e basi late lanceolata sensim longissime subulata, ad 7 mm longa, marginibus summo apice tantum serrulatis; nervo latissimo, basi bene limitato, excedente; cellulis subulæ superne quadratis, dein breviter linearibus, basilaribus internis laxe rectangularibus, hyalinis, externis angustissime linearibus, limbum pluriseriatum efformantibus, alaribus vesiculosis, fusco-aureis vel hyalinis, spatium excavatum efformantibus. Caetera ignota.

LUZON, Bontoc Subprovince, Mount Pukis, *Bur. Sci. 38253 Ramos and Edaño.*

Species foliis cellulis supremis quadratis a congeneribus jam dignoscenda.

Genus **DICRANOLOMA** Ren.

Dicranoloma braunii (C. Müll.) Par.

LUZON, Benguet Subprovince, Pauai, *Bur. Sci. 32062 Santos.*

Dicranoloma leucophyllum (Hamp.) Par. var. **kurzii** (Limpr.).

LUZON, Benguet Subprovince, Pauai, *Bur. Sci. 32056 Santos.*
Area: Java.

Dicranoloma reflexum (C. Müll.) Ren.

LUZON, Camarines Sur Province, Mount Isarog, *Bur. Sci. 22114 Ramos.*
Area: Java, Timor, Flores.

LEUCOBRYACEÆ

Genus **LEUCOBRYUM** Hamp.

Leucobryum sanctum Hamp.

LUZON, Apayao Subprovince, Mount Sulu, *Bur. Sci. 28334 Fenix.* MINDANAO, Surigao Province, *Bur. Sci. 34654 Pascasio:* Zamboanga Province, Malangas, *Bur. Sci. 37470 Ramos and Edaño.*

Leucobryum scalare C. Müll. var. **tjibodensis** Fleisch.

LUZON, Bontoc Subprovince, Bauco, *Bur. Sci. 3964 Vanoverbergh.*

Leucobryum pentastichum Doz. et Molk.

PANAY, Capiz Province, Libacao, *Bur. Sci. 35784 Martelino and Edaño:* Antique Province, *Bur. Sci. 32624 McGregor.*

Area: Java.

Leucobryum bowringii Mitt.

LUZON, Apayao Subprovince, Mount Sulu, *Bur. Sci. 28451 Fenix.*

Leucobryum sericeum Broth.

PANAY, Capiz Province, Libacao, *Bur. Sci. 35763 Martelino and Edaño.* BUCAS GRANDE ISLAND, *Bur. Sci. 35932 Ramos and Pascasio.*

Genus **CLADOPODANTHUS** Doz. et Molk.

Cladopodanthus muticus sp. nov.

Robustiusculus, caespitosus, caespitibus densis, rigidis, albescentibus. Caulis adscendens, ad 3 cm altus, dense foliosus, dichotome ramosus, ramis supremis brevibus. Folia imbricata, cochleariformi concava, elongate ovato-oblonga, rotundato-obtusa vel truncata, plerumque mutica, raro apiculata, c. 3 mm longa, marginibus superne late incurvis, integerrimis; nervo latissimo, leucocystis bistratosis, chlorocystis dorso approximatis; cellulis angustissimis, limbum basi 4 seriato, superne sensim angustiore, infra apicem desinente efformantibus. Caetera ignota.

PANAY, Capiz Province, Mount Salibongbong, on old tree, *Bur. Sci. 35787 Martelino and Edaño.*

Species distinctissima, a congeneribus foliis muticis jam dignoscenda.

Genus **OCTOBLEPHARUM** Hedw.

Octoblepharum albidum (L.) Hedw.

PANAY, Antique Province, *Bur. Sci. 32624 p. p. McGregor.*

Genus **LEUCOPHANES** Brid.

Leucophanes albescens C. Müll.

LUZON, Rizal Province, Antipolo, *Bur. Sci. 29576 Ramos and Edaño.*

Leucophanes octoblepharoides Brid.

PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35819, 35822 Martelino and Edaño.*

Leucophanes candidum (Hornsch.) Lindb.

LUZON, Rizal Province, Mount Lumutan, *Bur. Sci. 29817 Ramos and Edaño.* PANAY, Capiz Province, Libacao, *Bur. Sci. 35769, 35773, 35780 Martelino and Edaño.*

CALYMPERACEÆ

Genus **SYRRHOPODON** Schwaegr.

Syrrhopodon amoenus Broth.

LUZON, Laguna Province, Mount Maquiling, 750 meters, *Bur. Sci. 17060 Robinson.* PANAY, Capiz Province, Libacao, *Bur. Sci. 35771 Martelino and Edaño.*

Syrrhopodon revolutus Doz. et Molk.

CATANDUANES, *Bur. Sci. 30610* Ramos.

Syrrhopodon albovaginatus Schwaegr.

PANAY, Capiz Province, Libacao, *Bur. Sci. 35768, 35770 Martelino and Edaño;* Jamindan, *Bur. Sci. 30840 Ramos and Edaño.*

Syrrhopodon mülleri (Doz. et Molk.) Lac.

CATANDUANES, *Bur. Sci. 30609 Ramos.*

Syrrhopodon croceus Mitt.

PANAY, Capiz Province, Libacao, *Bur. Sci. 35779 p. p. Martelino and Edaño.*

Genus **THYRIDIUM** Mitt.

Thyridium constrictum (Sull.) Mitt.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28941 Ramos and Edaño.*

Genus **CALYMPERES** Sw.

Calymperes orientale Mitt.

POLILLO, *Bur. Sci. 10505 McGregor.*

Calymperes orientale Mitt. var. **polytrichoides** Fleisch.

PANAY, Capiz Province, Libacao, *Bur. Sci. 35781 Martelino and Edaño.*

Calymperes (Hyophilina) ramosi sp. nov.

Gracilescens, caespitosum, caespitibus densiusculis, atroviridibus. Caulis erectus, vix ultra 7 mm altus, basi fusco-radiculosus, dense foliosus, simplex vel furcatus. Folia normalia sicca incurva, humida erecto-patentia, profunde canaliculato-concava e parte vaginante brevi, haud latiore, minutissime serrulata late ligulata, rotundato-obtusa, ad 2.5 mm longa, marginibus late incurvis, integerrimis; nervo valido, infra summum apicem folii evanido, dorso superne scabriusculo; cellulis laminalibus minutissimis, subrotundis, papillosis, subpellucidis, cancellinis obovatis, e cellulis breviter rectangularibus compositis, basilaribus intramarginalibus anguste linearibus, teniolam 4 seriatam, brevem, luteam efformantibus, marginalibus uniseriatis, brevibus. Folia anomala in acumen elongatum, proboscideum apice dilatatum attenuata ibidemque filamentis fusiformibus, multiseptatis, fuscis fasciculatim obsessum. Caetera ignota.

LUZON, Rizal Province, Mount Lumutan, *Bur. Sci. 29824, 29825 Ramos and Edaño.*

POTTIACEÆ

Genus **WEISIA** Hedw.

Weisia edentula Mitt.

LUZON, Rizal Province, Mount Lumutan, *Bur. Sci. 29826 Ramos and Edaño.*

Genus **BARBULA** Hedw.

Barbula inflexa C. Müll.

LUZON, Batangas Province, Taal Volcano, *Bur. Sci. 29250 Ramos.*

Barbula consanguinea Mitt.

LUZON, Pangasinan Province, Labrador, Mount San Isidro, *Bur. Sci. 30138 Fenix.*

Barbula (Hydrogonium) edanoi sp. nov.

Gracilis, caespitosa, caespitibus densiusculis, fuscescentibus. Caulis erectus, ad 3 cm altus, inferne fusco-radiculosus, densiuscule foliosus, simplex. Folia sicca flexuoso-incurva, humida patentia, carinato-concava, lanceolata, acutiuscula, apiculo hyalino terminata, ad 2 mm longa et ad 0.57 mm lata, marginibus inferne anguste recurvis, integerrimis; nervo sat tenui, rufescente, infra summum apicem folii evanido, dorso laevi; cellulis laminalibus quadratis, 8–10 μ, minutissime verrucosis, pellucidis, basilaribus rectangularibus, laevissimis, infimis fuscis. Caetera ignota.

LUZON, Bontoc Subprovince, Bontoc, *Bur. Sci. 38267 Ramos and Edaño.*

Species cum B. hygrophila Fleisch. comparanda, sed foliis longioribus, angustius acuminatis, pellucidis dignoscenda.

Barbula (Eubarbula) subulata sp. nov.

Gracilis, caespitosa, caespitibus laxis, fuscescenti-viridibus. Caulis erectus, ad 1 cm vel paulum ultra altus, inferne fusco-radiculosus, laxiuscule foliosus, simplex. Folia erecto-patentia, sicca erectiora, flexuosula, carinato-concava, e basi lanceolata sensim longe subulata, acuta, ad 2 mm longa, marginibus recurvis, summo apice denticulis paucis instructis; nervo validiusculo, rufescente, continuo, dorso laevi; cellulis minutissimis, quadratis, basim versus sensim majoribus, basilaribus internis rectangularibus, omnibus laevissimis. Seta c. 1.5 cm, tenuissima, rubra. Theca minuta, oblongo-cylindrica, fusca. Caetera ignota.

LUZON, Bontoc Subprovince, Bontoc, *Bur. Sci. 38268 Ramos and Edaño.*

Species B. comosae Doz. et Molk. affinis, sed foliis brevioribus, in subulam angustam, acutam attenuatis dignoscenda.

Genus **TRICHOSTOMUM** Hedw.

Trichostomum (Oxystegus) atrovirens sp. nov.

Gracilescens, caespitosa, caespitibus densis, late extensis, atroviridibus. Caulis erectus vel adscendens, ad 2 cm altus, inferne fusco-radiculosus, dense foliosus, plerumque ramosus. Folia erecto-patentia, sicca crispula, canaliculato-concava, e basi brevi, vaginante late lineari-lanceolata, breviter acuminata, aristatula, ad 2.5 mm vel paulum ultra longa, integerrima vel summo apice minutissime serrulata; nervo valido, superne tenuiore, plerumque breviter excedente, laevi; cellulis laminalibus

minutissimis, rotundatis et quadratis, vaginalibus elongate rectangularibus, lutescentibus, omnibus laevissimis. Bractea perichaetii altus vaginantes. Seta vix ad 1 cm alta, tenuissima, lutea. Caetera ignota.

LUZON, Rizal Province, Mount Susong-Dalaga, *Bur. Sci. 29446 Ramos and Edaño.*

Species T. cylindrico (Bruch) C. Müll. affinis, sed foliis late lineari-lanceolatis dignoscenda.

Genus **HYOPHILA** Brid.

Hyophila micholitzii Broth.

LUZON, Rizal Provice, Mount Susong-Dalaga, *Bur. Sci. 29450 Ramos and Edaño.*

FUNARIACEÆ

Genus **FUNARIA** Schreb.

Funaria calvescens Schwaegr.

LUZON, Bontoc Subprovince, Mount Pukis, *Bur. Sci. 38265 Ramos and Edaño:* Lepanto Subprovince, Mount Data, *Bur. Sci. 40536 Ramos and Edaño:* Bulacan Province, Angat, *Bur. Sci. 34331 Ramos and Edaño.*

BRYACEÆ

Genus **WEBERA** Hedw.

Webera scabridens (Mitt.) Jaeg.

LUZON, Bontoc Subprovince, Mount Cagua, *Bur. Sci. 38229 Ramos and Edaño.*

Genus **BRACHYMENIUM** Schwaegr.

Brachymenium nepalense Hook.

LUZON, Bontoc Subprovince, Mount Cagua, *Bur. Sci. 38227 Ramos and Edaño:* Laguna Province, Mount Banahao, *Bur. Sci. 28016 Ocampo.*

Genus **BRYUM** (Dill.) Schimp.

Bryum ambiguum Dub.

LUZON, Rizal Province, Mount Lumutan, *Bur. Sci. 29819 Ramos and Edaño;* Mount Susong-Dalaga, *Bur. Sci. 29451 Ramos and Edaño:* Tayabas Province, Umirey, *Bur. Sci. 29087 Ramos and Edaño.*

Bryum coronatum Schwaegr.

LUZON, Ilocos Norte Province, *Bur. Sci. 33391 Ramos.*

Bryum ramosum (Hook.) Mitt.

LUZON, Bontoc Subprovince, Mount Cagua, *Bur. Sci. 38231 Ramos and Edaño;* Masapilid, *Bur. Sci. 38246 p. p. Ramos and Edaño.*

Genus **RHODOBRYUM** (Schimp.) Hamp.

Rhodobryum giganteum (Hook.) Mitt.

LUZON, Bontoc Subprovince, Mount Pukis, *Bur. Sci. 37776 Ramos and Edaño.*

MNIACEÆ

Genus **MNIUM** (Dill.) L.

Mnium rostratum Schrad.

LUZON, Bontoc Subprovince, Mount Pukis, *Bur. Sci. 38256 Ramos and Edaño.*

RHIZOGONIACEÆ

Genus **RHIZOGONIUM** Brid.

Rhizogonium spiniforme (L.) Bruch.

LUZON, Rizal Province, Mount Lumutan, *Bur. Sci. 29818, 29823, 29826 Ramos and Edaño;* Mount Susong-Dalaga, *Bur. Sci. 29445, 29448 Ramos and Edaño:* Pangasinan Province, Labrador; Mount San Isidro, *Bur. Sci. 30139 Fenix:* Apayao Subprovince, Mount Sulu, *Bur. Sci. Fenix;* Bontoc Subprovince, Mount Pukis, *Bur. Sci. 38257 Ramos and Edaño;* Mount Masapilid, *Bur. Sci. 38244, 38251 Ramos and Edaño.* MINDANAO, Bukidnon Subprovince, Mount Candoon, *Bur. Sci. 37183, 37188 Ramos and Edaño.*

HYPNODENDRACEÆ

Genus **MNIODENDRON** Lindb.

Mniodendron divaricatum (Reinw. et Hornsch.) Lindb.

LUZON, Bontoc Subprovince, Mount Masapilid, *Bur. Sci. 38245 Ramos and Edaño:* Laguna Province, Muont Banahao, *Bur. Sci. 28157 Ocampo.* PANAY, Antique Province, *Bur. Sci. 32630, 32651 McGregor:* Capiz Province, Mount Bulilao, *Bur. Sci. 35817 Martelino and Edaño.* MINDANAO, Bukidnon Subprovince, Mount Lipa, *Bur. Sci. 37164 Ramos and Edaño.*

Mniodendron korthalsii Bryol. jav.

LUZON, Kalinga Subprovince, Lubuagan; Mount Masingit, *Bur. Sci. 37520, 37535 Ramos and Edaño.*

BARTRAMIACEÆ

Genus **PHILONOTIS** Brid.

Philonotis revoluta Bryol. jav.

LUZON, Bontoc Subprovince, Bauco, *Bur. Sci. 3965 Vanoverbergh.*

Philonotis tjibodensis Fleisch.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28939 Ramos and Edaño.*

Genus **FLEISCHEROBRYUM** Loesk.

Fleischerobryum macrophyllum sp. nov.

Philonotis macrophylla Broth. in sched.

Robustum, caespitosum, caespitibus laxiusculis, e lutescente fuscescenti-viridibus, nitidiusculis. Caulis erectus, ad 6 cm altus, fusco-tomentosus, laxiuscule foliosus, vage ramosus vel apice ramis pluribus fastigiatis, ad 3 cm longis instructus. Folia erecto-patentia, carinato-concava, e basi ovali vel ovata sensim lanceolata, longe aristata, ad 5 mm longa et ad 1 mm lata, marginibus suberectis, superne minute serrulatis; nervo tenui, in aristam elongatam, minute serrulatam producto; cellulis superioribus anguste linearibus, apice papillose exstante, dein sensim latioribus, basilaribus laxis, tenereis, oblongo-hexagonis, laevissimis. Seta c. 5 cm vel paulum longiore, flexuosa, rubra. Theca immatura pendula, breviter oblonga, c. 5 mm longa. Planta mascula ignota.

LUZON, Bontoc Subprovince, Mount Polis, *Bur. Sci. 38289 Ramos and Edaño.*

Species pulcherrima a F. longicolli (Hamp.) Loesk. statura robustiore, foliis nervo in aristam elongatam excedente, cellulis longioribus, infimis laevissimis dignoscenda.

SPIRIDENTACEÆ

Genus **SPIRIDENS** Nees

Spiridens reinwardtii Nees.

LUZON, Bontoc Subprovince, Mount Masapilid, *Bur. Sci. 38242 Ramos and Edaño:* Apayao Subprovince, Mount Sulu, *Bur. Sci.*

28454 Fenix. PANAY, Antique Province, *Bur. Sci. 32621, 32654 McGregor.* MINDANAO, Davao Province, *Bur. Sci. Copeland "A."*

Spiridens longifolius Lindb.

LUZON, Kalinga Subprovince, Lubuagan, Mount Masingit, *Bur. Sci. 37521 Ramos and Edaño.*

ORTHOTRICHACEÆ

Genus **MACROMITRIUM** Brid.

Macromitrium rothostichum Nees.

LUZON, Bontoc Subprovince, Mount Cagua, *Bur. Sci. 38225, 38228 Ramos and Edaño.*

Macromitrium reinwardtii Schwaegr.

LUZON, Bontoc Subprovince, Mount Cagua, *Bur. Sci. 38224 Ramos and Edaño.* PANAY, Antique Province, *Bur. Sci. 32633 McGregor.*

Macromitrium salakanum C. Müll.

LUZON, Rizal Province, Mount Lumutan, *Bur. Sci. 29822 Ramos and Edaño;* Mount Susong-Dalaga, *Bur. Sci. 29452 Ramos and Edaño.*

Macromitrium subuligerum Bryol. jav.

LUZON, Pangasinan Province, Labrador, Mount San Isidro, *Bur. Sci. 30137 Fenix;* Tayabas Province, Umirey, *Bur. Sci. 29085 Ramos and Edaño.*

Macromitrium semipellucidum Doz. et Molk.

LUZON, Camarines Province, *Bur. Sci. 27416 Alambra.* PANAY, Capiz Province, Libacao, *Bur. Sci. 35782 Martelino and Edaño.*

Macromitrium assimile Broth.

MINDANAO, Bukidnon Subprovince, Mount Candoon, *Bur. Sci. 37181 Ramos and Edaño.*

Macromitrium merrillii Broth.

ALABAT ISLAND, *Bur. Sci. 10559 Merrill.*

Macromitrium sulcatum (Hook. et Grev.) Brid.

MINDANAO, Bukidnon Subprovince, Mount Candoon, *Bur. Sci. 37184, 37185 Ramos and Edaño.*

RHACOPILACEÆ

Genus **RHACOPILUM** Palis.

Rhacopilum spectabile Reinw. et Hornsch.

LUZON, Bontoc Subprovince, Mount Cagua, *Bur. Sci. 38230 Ramos and Edaño;* Mount Masapilid, *Bur. Sci. 38252 Ramos and Edaño:* Kalinga Subprovince, Lubuagan, Mount Masingit, *Bur. Sci. 37519 Ramos and Edaño:* Lepanto Subprovince, Mount Data, *Bur. Sci. 40533 Ramos and Edaño.* PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35805 Martelino and Edaño:* Antique Province, *Bur. Sci. 32648 McGregor.* MINDANAO, Bukidnon Subprovince, Tangkulan and vicinity, *Bur. Sci. 37176 Ramos and Edaño;* Mount Candoon, *Bur. Sci. 37187 Ramos and Edaño.*

CRYPHAEACEÆ

Genus **PILOTRICHOPSIS** Besch.

Pilotrichopsis dentata (Mitt.) Besch.

PANAY, Antique Province, *Bur. Sci. 32618, 32625 McGregor.*

MYURIACEÆ

Genus **MYURIUM**

Myurium foxworthyi.

LUZON, Laguna Province, Mount Banahao, *Bur. Sci. 28013 Ocampo.* PANAY, Antique Province, *Bur. Sci. 32636 McGregor.*

PTEROBRYACEÆ

Genus **PTEROBRYELLA**

Pterobryella longifrons (C. Müll.) C. Müll.

LUZON, Bontoc Subprovince, Mount Cagua, *Bur. Sci. 38028 Ramos and Edaño:* Benguet Subprovince, Mount Puloglogo, *Bur. Sci. 40554 Ramos and Edaño.*

Genus **GAROVAGLIA** Endl.

Garovaglia punctidens Williams.

LUZON, Bontoc Subprovince, Bauco, *Bur. Sci. 3952 Vanoverbergh.*

Genus **ENDOTRICHELLA** C. Müll.

Endotrichella elegans (Doz. et Molk.) Fleisch.

PANAY, Antique Province, *Bur. Sci. 32632 McGregor:* Capiz Province, Mount Bulilao, on tree at summit, *Bur. Sci. 35809 Martelino and Edaño.*

Genus **TRACHYLOMA** Brid.

Trachyloma papillosum sp. nov.

Robustiusculum, sordide viride, opacum. Caules secundarii ad 9 cm alti, inferne simplices, foliis minutis, remotis, squamaeformibus, dein pinnatim ramosi, dense et complanate foliosi, apice propagulis axillaribus, filiformibus, fuscis instructi, ramis patentibus, simplicibus vel longioribus, pinnatim ramulosis. Folia caulina patentia, late ovato-lanceolata, breviter acuminata, acuta, c. 2.5 mm longa, marginibus e medio ad apicem serratis; nervo simplici, tenui, ad medium folii evanido; cellulis laminalibus angustis, papillis crassis, singulis vel binis instructis, basilaribus brevioribus et laxioribus. Folia ramea minora, brevius acuminata, argutius serrata. Caetera ignota.

MINDANAO, Bukidnon Subprovince, Tangkulan and vicinity, *Bur. Sci. 37174 Ramos and Edaño.*

Species habitu T. indico Mitt. simillima, sed foliis papillosis a congeneribus adhuc cognitis dignoscenda.

TRACHYPODACEÆ

Genus **TRACHYPUS** Reinw. et Hornsch.

Trachypus hispidus C. Müll.

LUZON, Benguet Subprovince, Mount Pauai, about 2,200 meters, *Bur. Sci. 32055 Santos.*

METEORIACEÆ

Genus **FLORIBUNDARIA** C. Müll.

Floribundaria floribunda (Doz. et Molk.) Fleisch.

PANAY, Antique Province, *Bur. Sci. 32619 McGregor.* LUZON, Bontoc Subprovince, Mount Masapilid, *Bur. Sci. 38250 Ramos and Edaño:* Benguet Subprovince, Pakdal Hill, 1,500 meters, *Bur. Sci. 9742 ex p. Merrill.*

Genus **PAPILLARIA** (C. Müll.) C. Müll.

Papillaria fuscescens (Hook.) Jaeg.

LUZON, Bontoc Subprovince, Mount Polis, *Bur. Sci. 38236 p. p. Ramos and Edaño.*

Genus **AËROBRYOPSIS** Fleisch.

Aërobryopsis lanosa (Mitt.) Broth.

PANAY, Antique Province, *Bur. Sci. 32634, 32649, 32650 McGregor.*

Genus **METEORIUM** (Doz. et Molk.) Fleisch.

Meteorium miquelianum (C. Müll.) Fleisch.

PANAY, Antique Province, *Bur. Sci. 34647 McGregor.*

Genus **METEORIOPSIS** Fleisch.

Meteoriopsis reclinata (C. Müll.) Fleisch.

LUZON, Bontoc Subprovince, Mount Masapilid, *Bur. Sci. 38248 Ramos and Edaño.*

NECKERACEÆ

Genus **CALYPTOTHECIUM** Mitt.

Calyptothecium tumidum (Mitt.) Fleisch.

LUZON, Benguet Subprovince, Mankayan to Baguio, *Bur. Sci. 40534 p. p. Ramos and Edaño.*

Genus **NECKEROPSIS** Reichdt.

Neckeropsis lepineana (Mont.) Fleisch.

PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35824 Martelino and Edaño:* Antique Province, about 800 meters, *Bur. Sci. 32620, 32623 McGregor.*

Genus **HIMANTHOCLADIUM** (Mitt.) Fleisch.

Himanthocladium loriforme (Bryol. jav.) Fleisch.

LUZON, Apayao Subprovince, *Bur. Sci. 28336 Fenix:* Pangasinan Province, Labrador, Mount San Isidro, *Bur. Sci. 30141 Fenix.*

Genus **HOMALIODENDRON** Fleisch.

Homaliodendron flabellatum (Dicks.) Fleisch.

MINDANAO, Bukidnon Subprovince, Tangkulan and vicinity, *Bur. Sci. 37171 Ramos and Edaño.*

HOOKERIACEÆ

Genus **DISTICHOPHYLLUM** Doz. et Molk.

Distichophyllum subnigricaule sp. nov.

Dioicum; gracilescens, caespitosum, caespitibus laxis, depressis, pallide viridibus, opacis. Caulis procumbens, per totam longitudinem hic illic fusco-radiculosus, dense et complanate foliosus, cum foliis c. 2.5 mm latus, dichotome ramosus. Folia sicca haud contracta, faciliter emollita, lateralia patentia, e basi spathulata late ovalia, rotundato-obtusa, mutica vel apiculo terminata, ad 1.5 mm longa et a 0.8 mm lata, integerrima; nervo

tenuissimo, ad vel ultra medium folii evanido; cellulis laminalibus teneris, rotundato-hexagonis, internis 25–35 μ, externis in pluriebus seriebus minoribus, basilaribus oblongo-hexagonis, marginalibus angustissimis, limbum biseriatum, hyalinum efformantibus. Folia dorsalia et ventralia erectiora, minora brevius spathulata. Caetera ignota.

MINDANAO, Zamboanga Province, *Bur. Sci. 8324 Merrill.*

Species D. nigricauli Mitt. affinis, sed foliis laxius areolatis dignoscenda.

Genus **CALLICOSTELLA** (C. Müll.) Mitt.

Callicostella papillata (Mont.) Mitt.

LUZON, Rizal Province, Mount Lumilan, *Bur. Sci. 29827 Ramos and Edaño;* Mount Lumutan, *Bur. Sci. 29820 Ramos and Edaño;* Tayabas Province, Mount Binuang, *Bur. Sci. 28937 p. p. Ramos and Edaño.* PANAY, Capiz Province, Jamindan, *Bur. Sci. 30968, 31090, 31226 Ramos and Edaño.*

Callicostella beccariana (Hamp.) Jaeg.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28934 Ramos and Edaño.*

Genus **CYCLODICTYON** Mitt.

Cyclodictyon blumeanum (C. Müll.) Broth.

MINDANAO, Bukidnon Subprovince, Tangkulan and vicinity, *Bur. Sci. 37175 p. p., 3718 Ramos and Edaño.*

Genus **CHAETOMITRIUM** Doz. et Molk.

Chaetomitrium orthorrhynchum Doz. et Molk.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28938 p. p. Ramos and Edaño.*

Chaetomitrium elmeri Broth.

PANAY, Capiz Province, Libacao, *Bur. Sci. 35778 Martelino and Edaño.*

Chaetomitrium perarmatum sp. nov.

Gracilescens, rigidum, ramulos involvens laete viride, nitidiusculum. Caulis elongatus, repens, densissime ramosus, ramis patulis, strictis, vix ultra 1 cm longis, teretibus, simplicibus, obtusis. Folia ramea laxe imbricata, breviter oblongo-ligulata, rotundato-obtusa vel breviter ovato-oblonga, apiculata, ad 0.8 mm longa, dorso superne setulis crassis ornata, mar-

ginibus superne argute serratis; nervis binis tenuissimis, vix ad medium folii productis, cellulis anguste linearibus, apicalibus in foliis obtusis minutis, rotundatis. Bracteae perichaetii internae erectae, in acumen subulatum, argute serratum sensim attenuatae. Seta c. 1 cm alta, tenuis, setulis dense vestita, basi tantum laevis. Theca suberecta, obovata. Operculum longe subulatum. Calyptra mitraeformis, superne ciliis brevibus, patulis obtecta, basi fimbriata, fimbriis ex unica seria cellularum constructis.

LUZON, Apayao Subprovince, *Bur. Sci. 28335 Fenix.*

Species praecedenti similis, sed foliis dorso superne setulis ornata jam dignoscenda.

Genus **CHAETOMITRIOPSIS** Fleisch.

Chaetomitriopsis glaucocarpa (Reinw.) Fleisch.

LUZON, Kalinga Subprovince, Lubuagan, Mount Masingit, *Bur. Sci. 38217 Ramos and Edaño:* Benguet Subprovince, Pakdal Hill, 1,500 meters, *Bur. Sci. 9742 p. p. Merrill.*

SYMPHYODONTACEÆ

Genus **SYMPHYODON** Mont.

Symphyodon copelandii sp. nov.

Gracilis, caespitosus, caespitibus laxiusculis, lutescentibus, nitidis. Caules secundarii pendentes, steriles ad 5 cm longi, laxiuscule foliosi, pinnatim ramosi, fertiles breviores, bipinnatim ramosi. Folia caulina longe decurrentia, erecto-patentia, sicca laxe adpressa, concava, ovato-lanceolata, breviter acuminata, obtusiuscula vel acuta, ad 0.57 mm longa, marginibus erectis, superne serrulatis; nervis binis, tenuibus, infra medium folii evanidis; cellulus angustissime linearibus, apice papillosa exstante, basilaribus infimis abbreviatis, alaribus paucis minutis, quadratis. Folia ramea minora, densiora, argute serrata. Bracteae perichaetii internae e basi vaginante sensim lanceolato-subulatæ, integrae. Seta c. 1.5 cm alta, tenuis, rubra, superne scabro. Theca erecta, oblonga, dense spiculosa, fusca. Caetera ignota.

LUZON, Benguet Province, Pauai, *E. B. Copeland 1337.*

HYPOPTERYGIACEÆ

Genus **HYPOPTERYGIUM** Brid.

Hypopterygium ceylanicum Mitt.

LUZON, Bontoc Subprovince, Bauco, *Bur. Sci. 3953 Vanoverbergh.*

THUIDIACEÆ

Genus **PELEKIUM** Mitt.

Pelekium velatum Mitt.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28936 Ramos and Edaño.* PANAY, Capiz Province, Mount Salibongbong, *Bur. Sci. 35788 Martelino and Edaño;* Mount Bulilao, *Bur. Sci. 35807 Martelino and Edaño.*

Genus **THUIDIUM** Bryol. eur.

Thuidium meyenianum (Hamp.) Bryol. jav.

LUZON, Bontoc Subprovince, Mount Masapilid, *Bur. Sci. 38247 Ramos and Edaño.*

Thuidium investe (Mitt.) Jaeg.

LUZON, Rizal Province, Mount Lumutan, *Bur. Sci. 29821 Ramos and Edaño.*

Area: Barma.

Thuidium tamariscellum (C. Müll.) Bryol. jav.

LUZON, Benguet Subprovince, *12939 Fenix,* Trinidad, *Bur. Sci. 14133 Robinson.*

Thuidium cymbifolium (Doz. et Molk.) Bryol. jav.

LUZON, Kalinga Subprovince, Lubuagan, Mount Masingit, *Bur. Sci. 38220 Ramos and Edaño.*

Thuidium glaucinoides Broth.

MINDANAO, Bukidnon Subprovince, Mount Candoon, *Bur. Sci. 37189 Ramos and Edaño.*

BRACHYTHECIACEÆ

Genus **PLEUROPUS** Griff.

Pleuropus luzonensis Broth.

LUZON, Benguet Subprovince, Mankayan to Baguio, *Bur. Sci. 40534 p. p. Ramos and Edaño.*

Genus **RHYNCHOSTEGIELLA** (Bryol. eur.) Limpr.

Rhynchostegiella mindorensis (Broth.) Broth.

LUZON, Tayabas Province. Umirey, *Bur. Sci. 29086 Ramos and Edaño.*

Rhynchostegiella edanoi sp. nov.

Antoicum; gracilis, caespitosa, caespitibus densiusculis, mollibus, lutescenti-viridibus, nitidiusculis. Caulis elongatus, repens, per totam longitudinem hic illic fusco-radiculosus, pinnatim ramosus, ramis patulis, vix ultra 1 cm longis, plumose foliosis, simplicibus, obtusis. Folia horride patula, sicca contracta, ovato-lanceolata, in acumen subulatum sensim attenuata, ad 1.5 mm longa et c. 0.4 mm lata, marginibus erectis, ubique serrulatis; nervo tenui, ad medium folii evanido; cellulis anguste linearibus. Bracteae perichaetii internae vaginantes, raptim in acumen recurvum, elongate subulatum, minute serrulatum attenuatae. Seta 1.5–2 cm, tenuissima, ubique scabra, rubra. Theca horizontalis, anguste oblonga, sicca deoperculata sub ore contracta. Operculum longe subulatum.

LUZON, Kalinga Subprovince, Lubuagan, Mount Masingit, *Bur. Sci. 38218, 38221 Ramos and Edaño:* Bontoc Subprovince, Mount Pukis, *Bur. Sci. 38254, 38258 Ramos and Edaño.*

ENTODONTACEÆ

Genus **ERYTHRODONTIUM** Hamp.

Erythrodontium julaceum (Hook.) Par.

LUZON, Bontoc Subprovince, Mount Masapilid, *Bur. Sci. 38240 Ramos and Edaño.*

Genus **ENTODON** C. Müll.

Entodon longidens Broth.

LUZON, Bontoc Subprovince, Mount Masapilid, *Bur. Sci. 38248 p. p. Ramos and Edaño.*

Genus **CAMPYLODONTIUM** Doz. et Molk.

Campylodontium flavescens (Hook.) Bryol. jav.

MINDANAO, Bukidnon Subprovince, *Bur. Sci. 1506 Weber.*

Genus **TRACHYPHYLLUM** Gepp.

Trachyphyllum inflexum (Harv.) Gepp.

LUZON, Rizal Province, Mount Susong-Dalaga, *Bur. Sci. 29443 Ramos and Edaño.*

PLAGIOTHECIACEÆ

Genus **STEREOPHYLLUM** Mitt.

Stereophyllum (Moneurium) philippinense sp. nov.

Pseudoplagiotheciopsis philippinensis Broth. in sched.

Antoicum; gracilescens, caespitosum, caespitibus densiusculis, pallide viridibus, nitidis. Caulis breviusculus, repens, per totam longitudinem fusco-radiculosus, dense et complanate foliosus, cum foliis c. 3 mm latus, vage ramosus, ramis brevibus, obtusis. Folia lateralia patula, asymmetrica, arcuatula, oblongo-ligulata, breviter lanceolato-acuminata, acuta, ad 1.9 mm longa et ad 0.57 mm lata, apice minutissime serrulata; nervo tenui, ad medium folii evanido; cellulis laminalibus anguste linearibus, basilaribus numerosis quadratis, omnibus laevissimis. Folia dorsalia minora, erecto-patentia, symmetrica. Bracteae perichaetii internae e basi vaginante in acumen elongatum lineari-lanceolatum, minute serrulatum attenuatae. Seta vix ad 1 cm alta, tenuissima, rubra. Theca erecta, subregularis, anguste cylindrica. Operculum e basi conica breviter et obtuse rostratum.

LUZON, Rizal Province, Antipolo, *Bur. Sci. 29577 Ramos and Edaño.*

Species S. wightii (Mitt.) Jaeg. affinis, sed statura minore foliisque angustioribus dignoscenda.

SEMATOPHYLLACEÆ

Genus **ACANTHOCLADIUM** Mitt.

Acanthocladium (Tanythrix) benguetense sp. nov.

Gracilescens, caespitosum, caespitibus densis, fuscescentibus, nitidiusculis. Caulis elongatus, repens, hic illic fusco-radiculosus, dense foliosus, pinnatim ramosus, ramis patentibus, brevibus, arcuatulis vel longioribus, pinnatim ramulosis. Folia caulina erecto-patentia, sicca erectiora, concava, ovalia, sensim in acumen lanceolatum vel lanceolato-subulatum attenuata, ad 1.5 mm longis, marginibus erectis integris vel summo apice minutissime serrulatis; enervia; cellulis angustissime linearibus, apice papillose exstantibus basilaribus incrassatis, infimis fusco-aureis, alaribus magnis, oblongis, vesiculosis, hyalinis vel fusco-aureis. Folia ramea minora, lanceolata. Bracteae perichaetii internae e basi vaginante raptim in acumen elongatum, loriforme, minute serrulatum attenuatae. Seta ad 2.5 cm alta, tenuis, ru-

bra. Theca subhorizontalis, oblonga, gibbosula, sicca deoperculata sub ore vix contracta. Operculum ignotum.

LUZON, Benguet Subprovince, Pauai, *Bur. Sci. 32065 Martelino and Edaño.*

Species A. hornschuchii (Doz. et Molk.) affinis, sed foliorum forma jam dignoscenda.

Genus **TRISMEGISTIA** (C. Müll.) Broth.

Trismegistia rigida (Hornsch. et Reinw.) Broth.

LUZON, Apayao Subprovince, Mount Sulu, *Bur. Sci. 28453 Fenix:* Laguna Province, Mount Banahao, *Bur. Sci. 28017 Ocampo.*

Trismegistia lancifolia (Harv.) Broth.

MINDANAO, Bukidnon Subprovince, Mount Candoon, *Bur. Sci. 37182 Ramos and Edaño.*

Trismegistia lancifolia (Harv.) Broth. var. **korthalsii** (Doz. et Molk.) Fleisch.

CATANDUANES, *Bur. Sci. 30612 Ramos.*

Trismegistia prionodontella (Broth.) Broth.

MINDANAO, Bukidnon Subprovince, Tangkulan and vicinity, *Bur. Sci. 37177 Ramos and Edaño.*

Trismegistia densiretis sp. nov.

Gracilescens, caespitosa, caespitibus densis, lutescenti-fuscescentibus, nitidiusculis. Caules secundarii ad 3 cm vel paulum ultra longi, dense foliosi, pinnatim ramosi, pungentes ramis vix ad 1 cm longis, simplicibus. Folia caulina erecto-patentia, late ovato-lanceolata, raptim elongate subulata, ad 2.5 mm vel paulum ultra longa et ad 0.75 mm lata, marginibus erectis, superne minute serrulata; enervia; cellulis laminalibus angustissime linealibus, marginalibus tantum incrassatis, limbum pauciseriatum, indistinctum efformantibus, alaribus magnis, vesiculosis, externis divisis, fusco-aureis, spatium excavatum efformantibus. Folia ramea minora, ovato-lanceolata, superne argute serrata. Caetera ignota.

LUZON, Apayao Subprovince, Mount Sulu, *Bur. Sci. 28453 Fenix.*

Species distinctissima, foliis cellulis ubique anguste linearibus a congeneribus jam dignoscenda.

Genus **MEIOTHECIUM** Mitt.

Meiothecium obtusum Broth.

PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35815 Martelino and Edaño.*

Meiothecium attenuatum Broth.

PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35812 Martelino and Edaño.*

Genus **WARBURGIELLA** C. Müll.

Warburgiella cupressinoides C. Müll.

PANAY, Antique Province, *Bur. Sci. 32644 McGregor.* LUZON, Benguet Subprovince, Pauai, *Bur. Sci. 32065* Santos.

Genus **TRICHOSTELEUM** (Mitt.) Jaeg.

Trichosteleum hamatum (Doz. et Molk.) Jaeg.

PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35793 Martelino and Edaño*; Jamindan, *Bur. Sci. 31894 Ramos and Edaño.*

Trichosteleum hamatum (Doz. et Molk.) Jaeg. var. **semimamillosum** (C. Müll.) Par.

LUZON, Rizal Province, Mount Susong-Dalaga, *Bur. Sci. 29459 Ramos and Edaño.* PANAY, Capiz Province, Libacao, *Bur. Sci. 35762, 35764, 35775, 35785, 35788 Martelino and Edaño;* Mount Bulilao, *Bur. Sci. 35796, 35808, 35811, 35814, 35816, 35818, 35821 Martelino and Edaño;* Jamindan, *Bur. Sci. 31927 Ramos and Edaño.* MINDANAO, Bukidnon Subprovince, Mount Candoon, *Bur. Sci. 37169* (seta subisevi), *37186 Ramos and Edaño.*

Trichosteleum boschii (Doz. et Molk.) Jaeg.

PANAY, Capiz Province, Libacao, *Bur. Sci. 35767, 35772 Martelino and Edaño;* Mount Bulilao, *Bur. Sci. 35777 Martelino and Edaño.*

Genus **RHAPHIDOSTICHUM** Fleisch.

Rhaphidostichum piliferum (Broth.) Broth.

PANAY, Antique Province, mossy forest about 1,000 meters, *Bur. Sci. 32631 McGregor.*

Genus **ACROPORIUM** Mitt.

Acroporium subulatum (Hamp.).

PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35793 p. p., 35800 Martelino and Edaño.*

Acroporium sigmatodontium (C. Müll.) Fleisch.

LUZON, Bontoc Subprovince, Bauco, *Bur. Sci. 3967 Vanoverbergh.* PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35794, 35798, 35799, 35801, 35803, 35813 Martelino and Edaño.*

Genus **TAXITHELIUM** Spruc.

Taxithelium instratum (Brid.) Broth.

LUZON, Rizal Province, Mount Susong-Dalaga, *Bur. Sci. 29444 Ramos and Edaño:* Tayabas Province, Mount Binuang, *Bur. Sci. 22935 p. p. Ramos and Edaño.* PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35806, 35808, 35810, 35820 Martelino and Edaño;* Jamindan, *Bur. Sci. Ramos and Edaño.*

Taxithelium nepalense (Schwaegr.) Broth.

LUZON, Rizal Province, Antipolo, *Bur. Sci. 29572, 29579 Ramos and Edaño.* PANAY, Capiz Province, Libacao, *Bur. Sci. 35774 Martelino and Edaño.*

Taxithelium percapillipes Broth.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 22932 Ramos and Edaño.*

Taxithelium (Polystigma aptera) **argentatum** sp. nov.

Autoicum; robustiusculum, caespitosum, caespitibus laxiusculis, depressis, albescentibus, vel pallide lutescentibus, sericeo-nitidis. Caulis elongatus, repens, per totam longitudinem fusco-radiculosus, dense et complanate foliosus, pinnatim ramosus, ramis patulis, 5–7 mm longis, valde complanatis, simplicibus, obtusis. Folia caulina erecto-patentia, concaviuscula, ovato-lanceolata, in acumen breviter subulatum attenuata, ad 1.7 mm longa et ad 0.6 mm lata, marginibus erectis, integris vel apice indistincte serrulatis; enervia; cellulis angustissime linearibus, laevissimis, alaribus haud diversis. Folia ramea eisdem caulinis similia, sed brevius acuminata. Bracteae perichaetii internae erectae vel falcatulae, e basi vaginante sensim lanceolato-subulatae, integrae vel apice minutissima serrulatae. Seta 2.5–3 cm alta, tenuissima, rubra. Theca horizontalis, obovata, fuscidula.

LUZON, Apayao Subprovince, *Bur. Sci. 22334 p. p. Fenix.* PANAY, Capiz Province, Jamindan, *Bur. Sci. 30239 Ramos and Edaño.*

Species T. capillipedi (Bryol. jav.) Broth. affinis, sed statura robustiore foliorumque forma dignoscenda.

Taxithelium robinsonii Broth.

MINDANAO, Bukidnon Subprovince, Tangkulan and vicinity, *Bur. Sci. 37178 Ramos and Edaño.*

Genus **GLOSSADELPHUS** Fleisch.

Glossadelphus (Anastigma) bakeri sp. nov.

Taxithelium divergens Broth. in sched.

Gracilis, caespitosus, caespitibus densiusculis, depressis, saturate viridibus, opacis. Caulis elongatus, repens, per totam longitudinem fusco-radiculosus, laxiuscule foliosus, densiuscule pinnatim ramosus, ramis vix ultra 5 mm longis, dense et complanate foliosis, simplicibus, obtusis. Folia caulina patentia, concava, ovato-lanceolata, in subulam attenuata, ad 1 mm vel paulum ultra longa, marginibus ob cellulas exstantes subserrulatis; enervia; cellulis breviter linearibus, papilla magna, apicali instructis. Folia ramea eisdem caulinis similia, sed brevius acuminata, distinctius serrulata. Caetera ignota.

LUZON, Laguna Province, Mount Maquiling near Los Baños, *Baker 2588.*

Species a congeneribus foliorum forma prima fronte dignoscenda.

HYPNACEÆ

Genus **ECTROPOTHECIUM** Mitt.

Ectropothecium monumentorum (Dub.) Jaeg.

PANAY, Capiz Province, Libacao, *Bur. Sci. 35783 Martelino and Edaño.*

Ectropothecium luzoniae (C. Müll.) Broth.

LUZON, Bontoc Subprovince, Mount Pukis, *Bur. Sci. 38266 Ramos and Edaño.* PANAY, Antique Province, *Bur. Sci. 32640, 32655 McGregor.*

Ectropothecium ferrugineum (C. Müll.) Jaeg.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28937 Ramos and Edaño.* PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35795, 35797 Martelino and Edaño.* MINDANAO, Bukidnon Subprovince, Tangkulan and vicinity, *Bur. Sci. 37172 Ramos and Edaño.*

Ectropothecium subintorquatum Broth.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28935 Ramos and Edaño.* MINDANAO, Bukidnon Subprovince, Tangkulan and vicinity, *Bur. Sci. 37179 Ramos and Edaño.*

Ectropothecium falciforme (Doz. et Molk.).

MINDANAO, Bukidnon Subprovince, Tangkulan and vicinity, *Bur. Sci. 37173 Ramos and Edaño.*

Ectropothecium brachyphyllum Broth.

PANAY, Antique Province, *Bur. Sci. 32641, 32645 McGregor.*

Ectropothecium cyperoides (Hook.) Jaeg.

PANAY, Capiz Province, Libacao, *Bur. Sci. 35766 Martelino and Edaño.*

Genus **TRACHYTHECIUM** Fleisch.

Trachythecium verrucosum (Hamp.) Fleisch.

PANAY, Capiz Province, Mount Bulilao, *Bur. Sci. 35807 Martelino and Edaño.*

Genus **VESICULARIA** (C. Müll.) C. Müll.

Vesicularia meyeniana (Hamp.) Broth.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28936 p. p. Ramos and Edaño.* PANAY, Capiz Province, Mount Salibongbong, *Bur. Sci. 35789, 35792 Martelino and Edaño;* Jamindan, *Bur. Sci. 31074 Ramos and Edaño.*

RHYTIDIACEÆ

Genus **GOLLANIA** Broth.

Gollania benguetensis sp. nov.

Gracilescens, caespitosa, caespitibus densis, late extensis, mollibus, lutescenti-viridibus, nitidis. Caulis procumbens, dense et complanate foliosus, plus minusve distincte pinnatim ramosus, ramis brevibus, simplicibus vel longioribus, pinnatim ramulosis. Folia falcata, concava, ovalia, raptim in acumen lanceolato-subulatum attenuata, ad 1.9 mm longa, marginibus erectis, acumine serrulatis; nervis binis, tenuibus, longiusculis; cellulis angustissime linearibus, apice exstante, alaribus paucis, minutis, incrassatis. Caetera ignota.

LUZON, Benguet Subprovince, Mankayan to Baguio, on decayed trunks, *Bur. Sci. 40534 p. p. Ramos and Edaño.*

Species foliis falcatis oculo nudo jam dignoscenda.

DIPHYSCIACEÆ

Genus **DIPHYSCIUM**

Diphyscium involutum Mitt.

LUZON, Rizal Province, Mount Lumutan, *Bur. Sci. 29828 Ramos and Edaño.*

POLYTRICHACEÆ

Genus **RHACELOPUS** Doz. et Molk.

Rhacelopus pilifer Doz. et Molk.

PANAY, Capiz Province, Jamindan, *Bur. Sci. 30864 Ramos and Edaño.*

Genus **POGONATUM** Palis.

Pogonatum microstomum R. Br.

LUZON, Benguet Subprovince, Pauai, about 2,200 meters, *Bur. Sci. 32067 p. p. Santos.*

Pogonatum spurio-cirratum Broth.

LUZON, Benguet Subprovince, Pauai, about 2,200 meters, *Bur. Sci. 32053, 32067 Santos:* Bontoc Subprovince, Mount Pukis, *Bur. Sci. 38264 Ramos and Edaño:* Lepanto Subprovince, Mount Pangualaytacay, *Bur. Sci. 40532 Ramos and Edaño.*

Pogonatum macrophyllum Doz. et Molk.

LUZON, Laguna Province, Mount Banahao, *Bur. Sci. 28012 Ocampo.*

Pogonatum wallisii (C. Müll.) Jaeg.

LUZON, Bontoc Subrovince, Mount Polis, *Bur. Sci. 38237 Ramos and Edaño.*

DAWSONIACEÆ

Genus **DAWSONIA** R. Br.

Dawsonia superba R. Br.

MINDANAO, Bukidnon Subprovince, Mount Lipa, *Bur. Sci. 38593 Ramos and Edaño.*

BATÁN TEXTS WITH NOTES

By Otto Scheerer

Of the University of the Philippines

Batán is the name of the chief member of that group of islands between Luzon and Formosa which is called the Batán Islands or, in an older Spanish form, the Batanes. In English literature the group is found designated as Bashi or Vashi Islands, a name bestowed upon it by Dampier and his men on their visit in 1687 on account of the liberal use made by the inhabitants of a certain beverage known all over northern Luzon as *basi*, a product of the fermented juice of sugar cane.

Only three of the several islands can properly be called inhabited; namely, Batán, Sabtang, and Itbayat. The rest have at best a few huts of detached herdsmen or are only occasionally visited by fishermen. The Census of 1918 gives the group a population of 8,214 souls, distributed over six townships and nineteen barrios or outlying villages. The townships are Basco, Mahatau, Ivaná, and Uyugan on Batán, Sabtang on the island of like name, and Mayán on Itbayat. The capital is Basco which, as a spiritual community, is also called Santo Domingo de Basco, while the people themselves know it as Vasay.

The language of the inhabitants of Batán and Sabtang is fairly uniform; that is, no difficulty whatever exists in mutual comprehension, although the people of different towns allow each other certain local phonetic and lexical peculiarities. They allude to their language as *chirin nu ivatán* (that is, speech of the people of Batán) or occasionally also as *inivatán* (that is, what is peculiar of the people of Batán). The form Batán having once come into use in Indonesian linguistics, I have retained this in the present paper.

On Itbayat a dialect closely allied to Batán is spoken, of which the Batanese proper used to say that it is unintelligible to them, while they themselves are understood by those from Itbayat. I consider the differences marked enough to justify me in speaking of it as a subdialect of Batán.

Of the language of the Ivatán people but little has come to be known so far. Of works dealing with it more or less extensively from a linguistic point of view, as also of such that use it as a means for religious instruction, a number is listed in Blake.[1] The majority of works published is by Spanish authors, and the Spanish orthography applied in these books to Batán does not make them a safe guide for students of Indonesian languages in general. Information on the phonology of Batán is found in the well-known Brandstetter series, in Conant's "The pepet law in Philippine languages," [2] "The RGH law in Philippine languages," [3] and "Indonesian *l* in Philippine languages," [4] and in my "Ein ethnographischer Bericht ueber die Insel Botel Tobago," [5] and in my prologue to "Diccionario español-ibatán por varios PP. Dominicos," Manila, 1914. For grammatical notes see Blake "Contributions to Comparative Philippine Grammar." [6]

Texts taken directly from the mouth of the people, especially from what may be called their unwritten literature, have so far been lacking. The samples here for the first time given, though primarily meant to supply material for linguistic studies, will afford at the same time some insight into certain customs and psychological traits of the islanders, and will show them to possess a certain inclination for poetical conception engendered, it would appear, from their outward circumstances of life.

The natural surroundings in which the Ivatán passes his life furnish him certainly with emotions and events of sufficient intensity to incite to a representation in literary style. The islands are of a great charm, a charm that grows on the visitor as he prolongs his stay: hills and valleys and grassy uplands form an open sunny landscape rich with pastures and fields, the latter hemmed in with flowering shrubs and trees. The almost northern character of the country is offset by a few higher elevations of volcanic origin the denser vegetation of which bears witness to the tropical location. Looking out to sea, the eye rests on a fringe of madreporal shelves over which the blue waves, broken

[1] A bibliography of the Philippine languages, part I, p. 68, Jaos, 40, 1.
[2] Anthropos, VII, 920–947.
[3] Jaos, XXXI, 70–85.
[4] Jaos, XXXVI, 181–196.
[5] Mitt. d. Ges. f. N. & V. Ostasiens 11: 2.
[6] Jaos, XXVII, pp. 317–396.

farther out in a line of silvery foam, come lazily rolling in to die out on a beach of fine white sand; or it follows the curving coast line to some rugged promontory with bowlder-strewn foreshore and to the wide ocean beyond. Unfortunately the islands are the theater of very frequent storms: during one half of the year there prevail typhoons with winds from the southwest; during the other half, fierce gales from the north and northeast, all working destruction on land and sending mighty waves from the open surging through the tiny isles. Lucky the year that passes without a boatload of people, trying to reach a neighboring island, being swept away by one of these storms, never to be heard of again. At such times the thatched roofs of the dwellings are kept from being blown away by being firmly tied down with large nets to the massive stone walls of the houses. For the same reason the stalks of sugar cane in the fields must be made to grow up securely bundled together in threes or fours and on reaching a height of about two meters every four such bundles are again tied together by their crowns into a pyramidic group in order better to withstand the onslaught of the storms. The growing of rice, corn, and millet being under such conditions extremely precarious, the people rely for a staple food upon such better protected crops as yams and sweet potatoes, and even these are often washed away by the rainstorms, together with the cultivated soil from the slopes on which they are planted. The people are thus exposed to periods of starvation which are rendered the more serious in that for the greater part of the year all succor from the mainland of Luzon is cut off by the heavy weather out at sea.

The people are good-natured, law-abiding, and submissive. Their predilection for basi has already been mentioned. Sugar cane is planted in order to obtain, besides some muscovado and vinegar, mainly the raw material for this beverage, the name of which has been changed by the islanders since Dampier's times—perhaps for diplomatic reasons—to *palek* (or *palœk*). The chief place of its production is Basco, a locality favored by nature with a moderate extension of fertile level land, and the preparation and the sale of palek form here a not unimportant branch of industry, while its consumption in general is very far from constituting a degrading tribal vice: it is simply the beer of the hard-working Ivatán people. After the day's work in the fields is done, they like to gather in friendly

reunions in their houses where, seated on long benches around the room, they engage over a pot of this palek in animated conversation, exchanging stories and songs. Everyone present is expected to make his contribution to the entertainment; if unable or unwilling to tell a story (*mangunununung*) or to sing (*mayladyi*), he may have to redeem himself by a contribution in kind to the common stock of palek. At such occasions there are heard improvisations as well as songs handed down from ancient times. The topic of these songs appears to be mostly the social life of the clan treated with a markedly moralizing tendency. They are characterized by a veiled significance, for which they are called *pinasinmo* (also *pinanmo*); that is, significative songs. Where this veiled speech coincides in ancient songs with "old words" of almost forgotten meaning, the sense is apt to become enigmatical to a degree that even white-haired natives, reputed authorities on their language, fail to agree on a correct interpretation, which makes translation of such songs into English a matter of considerable difficulty. Besides the songs (*ladyi*) sung at social gatherings and which we may compare, in a way, to those of the Tagalog *balagtasan* and the Bisayan *kantahay*, they have others, sung in chorus by field-workers or by boatmen and called *kalusan;* one such will be found among the texts.

The acquisition of my texts was made during a residence in those islands in 1908 and 1909. Charged with the introduction of a new political organization, I had, after a period of some agitation, the satisfaction of securing for them a provincial constitution independent from that of the far-away province of Cagayan on the mainland of Luzon whither they had previously been sending their taxes; in exchange, I had to abandon, to a very large extent, my hopes for a detailed philological study of the people. The description of the voyage of the sailing vessel *San Carlos*, which forms the main part of the present texts, was written upon my request, by an excellent man, native of the township of Mahatau on Batán, of the name of Marcelino Fabro, a representative of that old Spanish culture which was brought to the Batanes by Dominican missionaries and grafted on a preëxistent good native stock. The Ivatán, who, like others, pay spontaneous deference to men of superior ability, esteem especially those who have proved themselves successful leaders at sea, and there was nobody better able to forecast the weather by watching the sea break on the forelands, nobody better versed in the intricate network of currents running through the islands

than Fabro.[6] In his manuscript, it is true, he shows himself as sharing the general inclination of his countrymen to make light of the forms and rules of his language; he often wavers between the speech-forms of the capital Basco and his own (Mahatau) localisms, nor is he always consistent in his orthography. Sooner, however, than correct these shortcomings by attempting to establish a standard Ivatán language, which nowhere (not even in Basco itself) exists, I have preferred to point out such differences in the notes, and have restricted myself to replacing wholly inadequate Spanish letters by symbols more in consonance with the alphabet of the International Phonetic Association. Similar remarks apply to the songs which likewise were written down by natives and translated with their help into English, as was done with Fabro's manuscript. No accent marks being used in any of the sources and accentuation being moreover very indistinct in the spoken language, which is of a soft and elusive intonation, special care was taken in this regard in preparing the texts, and different speakers were closely questioned; even so, the result was not always entirely satisfactory. The weight of the voice may be said to fall as a rule on the penult; taking this as a general principle, an acutus was placed only on accented ultimas. The necessity to indicate, by a grave accent, the peculiar abrupt pronunciation given to a final vowel before a glottal check could be established only in a very few cases; this peculiarity may, however, also occur in a number of other words. Some of the most notable inconsistencies to be found in the texts are the following:

The indiscriminate use of *u* and *o*, as of *i* and *e*, in what are identical words. This might have been remedied by using in all such cases one definite letter, if the fluctuating spelling did not reflect an equally wavering pronunciation, a fact of the language it was considered better

[6] The relation thus created between a leader and his followers is, however, found in the Batanes tempered by a markedly democratic trait. Planning an inspection of a certain township by surprise, I once set out from Basco in a boat rowed by some six men, the helmsman having been given at the start a feigned destination. A few miles out at sea, the order to change the course for the town to be inspected was, however, not so quickly complied with as expected, a consultation first taking place in which the pilot gave the rowers a chance to express themselves on the risk to be incurred by changing the itinerary. A similar prudent consideration of the opinions of one's followers will be found also in Fabro's story; it may, indeed, be a characteristic Indonesian trait for a group of freemen under a leader.

not to cover up; thus the pepet vowel, which, according to Conant, becomes in Batán as a rule *e* in a final root syllable, and *a* in a penultimate syllable, was heard by me in certain words, and especially after labials, as a distinct *æ*. The suffix containing the pepet is pronounced mostly *-en*, sometimes *-in*. Possibly one of these varying pronunciations may ultimately prevail for all cases; for the present no standard can be established;

The apparent indifference to a fixed criterion for the use of suffix *-an* to denote the (real or figurative) place of action and of suffix *-en* for the direct object of action, a latitude found, by the way, also in other Philippine languages;

The unstable use made of the forms *u* and *nu*, for the article preceding the subject of the sentence.

It may finally not be superfluous to state that the English of the translations given in the texts is meant to follow the Batán wording as literally as at all possible and that it should be judged only from this point of view.

VIAHE NU PANKO SAN CARLOS

Yaken, si Marcelino Fabro, onunungan ku u na viahe chu du awan a 1893:

1. Du vidang a dima nu Hulio du awan a 1893 am minawará u vidarin namen a mahumay a ayukayam as kuminaru

VOYAGE OF THE PANKO SAN CARLOS

I, Marcelino Fabro, relate my voyage made in the year 1893:

1. On the date fifth of July of the year 1893 (there) came our favorable sailing breeze, a soft northeaster, and we left

Title. *Viahe*, from Span. *viaje*, voyage. My orthography of Batán words follows the general rule of pronunciation; namely, English consonants and Spanish vowels.

Panko, a small sailing craft of less than twenty tons, with deck and mat sails. The pankos of the Batanes, each the common property of the people of one of the townships, and laden by them with pigs, lard, onions, and garlic, used to make one trip a year to Manila, or two to Aparri. They are manned by volunteers from among the freighters.

Introduction. *onunungan ku*, report my, from *onunung*, relate.

u na viahe chu: na viahe is a sort of "perfect tense" of the noun "*viahe;*" compare: *u na tulas ku*, the letter I have written; *chu* (or: *cho*), my, from *ku* (or: *ko*) under the influence of preceding *e* (*i*).

1. *vidang*, number.

1893, read: *asa libu kanu waho yatus kanu siam a poho kanu atdo.*

minawará, perfect of *mawará*, arrive.

vidarin, sailing wind; from *vidad*, sail; *mamidad*, make sail.

ayukayam, northeast wind; other divisions of the wind rose are: N: *idaud;* NNW: *tahuara;* NW: *munmo;* WNW: *maidaud avayat;* W: *avayat;* WSW: *maraya avayat;* SW: *itaaw;* SSW: *paytayua-*

kami du araw auri a mangay du viahe du Aparri; am nu marahet a palak namen am rinawat namen du kayán namen du Canal du Balingtan, tan minaychihat u kapihœxteng na.

2. As dawa nu aváng am nayfirmi a mipaiso a mipangay du taaw du China, am nu taaw am uyud a mauhas as pagchinen namen su bote a mangamong su bedberen namen a yapu du rawo, am du dekéy a mi-

that day to go on our trip to Aparri; but (it was) our bad luck that met us during our presence in the Balingtan Channel; for suddenly a state of calm set in.

2. And therefore the ship kept retroceding going to the China Sea, and the sea being quite smooth, we lowered the boat to fish our bait from a field of floating sea-grass, and after a few minutes they al-

wan (between) *nu sumla kanu avayat;* S: *sumla;* SSE: *paytayuawan nu sumla kanu kuvi;* SE: *kuvi;* ESE: *palahañitan;* E: *pangaditan;* ENE: *paytayuawan nu ayukayam kanu pangaditan;* NNE: *paytayuawan nu idaud kanu ayukayam.*

kuminaru, perf. of *kumaru,* go away.

mangay, go, perf. *nangay;* place whither one goes, *angayan.*

rinawat, perf. of *rawaten,* what is received.

kayán, stay, sojourn; stem *ian,* idea of being in a place; *yanan,* abode.

minaychihat, perf. of *maychihat,* what occurs suddenly.

kapihœxteng, state of calm; the wind lulls, *maxteng* (or: *manghœteng*) *u salawsaw;* here as farther on *x* stands for the voiceless velar continuant.

2. *aváng,* ship, in general; *mayaváng,* go in a ship; perf. *nayaváng;* used in reference to navigating among the Batanes Islands; if implying a departure from the Batanes, as for Manila, the intensive form *mangavang,* perf. *nangavang,* is used. *Pangavángan,* name given Luzon as place where ships go or come from.

nayfirmi from Sp. *firme,* firm; here "continuously."

mipaiso, go backward; *mipa-* generally expresses "to dispose one's self to do what is expressed by the stem;" *iso,* backwards.

mipangay, compare *mipa-* just explained, and *mangay* given above.

taaw (or: *taw,* with long *a*), the sea; Ilk. *taaw,* the deep sea.

uyud, true, very, really.

am, after the subject it serves for predication in the manner of our copula; between clauses it appears to indicate simply the progress of the discourse, having sometimes the force of "but."

pagchinen, what is put down; Basco pronounces *pagtinen;* perf. *pinagtin;* put down, *gumtin,* perf. *gumintin.*

mangamong, catch fish, from *among,* fish in general; perf. *nangamong.*

bedberen, object of tying with string, especially the bait fastened to the hook; bait in general is *apan.*

yapu, origin; *makayapu,* with following *du,* = "from."

nutos am mirua daná sira a mayvidi du aváng a mian su papiri among as pasakayan namen daná su bote. Nu salawsaw am mayunung pa ayukayam as nunuyan namen daná su sayrin nu aváng.

ICHAPAT NA KA ARAW

3. Du asa ka araw am minakapat kami su iú. Nu aváng am maifirmi pa a mipaiso a namanda du kasngen namen du Canal Bashi am du kayán namen daná daw am minaychaknin kami du asa ka mavœkhas du kavuya namen su dekéy a uri a isla abnikan su

ready came back to the ship with a few fishes, and we took the boat aboard. The wind continued still in the northeast and we were dragging the ship's fishing tackle (through the water).

THE FOURTH DAY

3. On one day we caught four sharks. The ship was still steadily going back until we were in proximity of the Bashi Channel, and when we were already there we were startled one morning upon seeing that small island there, called Iami, knowing that the people are

rawo, floating patches of seaweed used by small fishes for spawning.
dekéy (or: *dekœy*), small; also name of a small island west of Ivuhos.
mirua, return, repeat; perf. *minirua;* nom. obj. *piruahen*, perf. *pinirua.*
daná, already.
mayvidi, return, perf. *nayvidi; kapayvidi*, the return.
mian, have, be, exist, dwell; *mian u asa vatahen ko dimo*, I have to tell you something, there is something I have to tell you.
papiri (in Basco: *papœrre*), few; stem: *piri* or *pœre.*
pasakayan (radical *sakáy*), what is lifted aboard a ship; we would expect the form *pasakayen* (perf. *pinasakay*) as object of lifting, which might also be used here. Compare farther on: *nunuyan* for *nunuyen*, object of dragging.
sayrin, fishhook; *manayrin*, fishing with such.
3. *asa ka araw*, often contracted to *asa karaw; ka* here seems to help the numeral to present the objects counted as units; compare: *dadua ka vatu*, two stones, etc.
minakapat (from *minaka-apat*) *kami*, got four we; compare: *minakasa ko*, from *minaka asa ako*, got one I; *nakadadua ka*, got two you.
iú or *iyú*, shark; Basco has *íu* or *íyu.*
namanda, until, unto, from *panda*, end, limit.
kasngen, from *asngen*, near; *kasngen namen*, our being near.
daw, from *d* plus *aw*, there.
minaychaknin, perf. of *maychaknin*, who is startled; stem *aknín*, sudden.
uri, that there; often contracted with preceding *a* to *auri, ori.*
isla, Pilot Fabra shows himself here and elsewhere in possession of some knowledge of Spanish; island in Ivatán is *pungsú;* the island meant is Botel Tobago.

Iami a mapanmu namen a dyiasarayan a tao, as du kuanasaori am mavuya namen pa u asa ka isla a uyud a makarang a mavawa pa, as nu kakarangan na u chinakalú namen a makavuya sia.

4. Du makuyab nu nakavuya namen su isla siraya am nairaya kami du asaori du isla abnikan su Iami. Minapnu kami nu kamunu tao a matdá du isla aori du kadekéy nu sakayan namen a maparin da a pisarasarayan; am angu u pariñen namen du masngen daná u kadiman namen nu kawau, as du kapipamahep na am chinañitan ku pava a pagchinen

not to be trusted and after a short while we saw another island, very high, and yet far away; and (it was only) its height made it so early visible to us.

4. In the afternoon of (the day of) our sighting these islands we were nearer the shore of that one island called Iami. We were filled with fear of the people living on that island because of the smallness of our ship which they could damage; but what were we to do, being almost dead with thirst; still, when night fell, I did not yet dare to lower the boat for

abnikan, radical *abnik* (*benek?*), idea of naming.
mapanmu, know, radical *anmu*, signification.
dyiasarayan, negative (*dyi*=not) of a positive *kasarayan*, who is trusted; *dyi* is the palatalized Mahatau pronunciation of Basco *di;* in the present text both forms occur, mostly prefixed to the following word.
kuanasaori, idiom for: shortly afterwards, also for: meanwhile.
chinakalú, perf. of *ichakalú*, what causes hurry; *kalú*, quick; *Angu u ichakalú mo?* What puts you in a hurry? Text says literally: "and the height its [that is, of the mountain] was the cause of our being quick in perceiving it." Evidently Formosa is meant.
4. *siraya*, from *sira* (they) and *aya* (this); *sira* is often used to denote plurality.
nayraya, perf. of *mayraya* or *mayaraya*, going to shore.
kamu, fear; *mamu*, one afraid; radical *amu*.
matdá, dweller; *katdaan*, dwelling place; radical *tidá*, Tag. *tirá*.
maparin, possible; *makaparin*, able to do; *kapakapamarin*, power.
pisarasarayan, from *saray*, damage.
angu, what?; also: thing, as in *angu-angu*, possessions (especially gold and silver): *angu uri?* what is that?
pariñen, object of doing; cf. *maparin* above.
kadiman, death, from *diman*, idea of dead.
kapipamahep, the setting in of night, from *ahep*, night; similarly: *kapisarisari*, dusk, from *sari*, dark.
chinañitan, perf. of *kañitan*, daring; *makañit*, who dares. In Basco: *makanit, kanitan*, etc; radical *añit* (*anit*), acting by one's self.
pava, from *pa*, yet, plus *ava*, not.

u bote a muranúm, as pinatanggalan ku na sira su grumetes du kagchin da anu kapisexsexdang na a manita su ranúm du tana aori a di namen pa chinakaran.

5. Du kamahep daná ori am nakaichéx akuava a namanda du kamaraw. As misexsexdang daná am talamarin namen u tana am maidaud kami du nakapipakaha nu ries, as nu salawsaw am mayunung pa as pakaichéx ku su dekéy am du kuanasaori am vatahen da u kayán da nu sakayan a makahaud a mipangay dyamen, as du nakaknin ku du horas aori am nañieng a mitatayatto u ka-

fetching water and (only) instructed the sailors as to their going down at daybreak to look for water on that land not yet trodden by us.

5. That night I did not go to sleep until daylight. When daylight began to appear, we looked out to the land and (found) we were far out to sea as the current had become slack, and as the wind was still steady, I was enabled to sleep a little, but after a short while they told me of there being boats setting out from the shore and being about to come towards us, and from the con-

muranúm, an "intentionalis" from *ranúm*, water: going for water.
pinatanggalan, perf. of *patanggalan;* radical *tanggal* advise in advance, prepare.
grumete, Span. for "young sailor."
kapisexsexdang, dawning of day; *sexdang*, splendor, irradiance.
manita, who seeks; *chitahen*, object of seeking; radical *chita.*
tana, land, soil, earth.
chinakaran, perf. of *kakaran*, place trodden on.
5. *nakaichéx*, perf. of *makaichéx*, go to sleep.
akuava, from *aku*, I, plus *ava*, not.
misexsexdang, getting light; *masexdang daná u araw*, the sun is already shining; Tag. *sumilang*, rising of sun, moon, or stars; *silangan*, the orient.
talamarin, object of spying out; radical *talamad.*
maidaud, being far out in the open sea; cf. *idaud*, north wind.
nakapipakaha, radical *kaha*, weak.
ries (*riyes*), current; the two chief currents setting through the Batanes are one from northwest to southeast, known as *isāk*, and one in the opposite direction, called *amteng;* they coincide and change with the tides.
vatahen, obj. of saying, perf., *vinata; makavata*, say.
makahaud, setting out from the shore.
horas (Span.), hours, here: time.
nañieng, suddenly (Basco: *nanieng*).
mitatayatto (Fabro's spelling) *u kalangangan ku*, literally: my stomach rising strongly. Compare: *Makatayato ava*, He makes no

langangan ku a malakám nira nu dyinamen pa siraya a navuya.

6. Du katalamad namen su sakayan sira ori am tatdo sira kasakayan am nu asa dira am miñirua a mayvidi am kayán nu kauyud namen a mamu, ta du kaidaud namen as kapakañit da a rumanun dyiamen am chinanggal namen u kaheyet da kanu kanaub nu vuhó da as kapanmu namen pa su nanma kañiamen a nangay daw a ñidiman da as kahap da su ichakey da du aváng aori.

sternation I felt at that time suddenly my heart leapt into my mouth from a violent fear of those whom we had never seen before.

6. On closely observing them (we found that) these boats were three and one of them turned to go back, and we were truly alarmed because, we being so far out at sea, their daring in coming out to us forewarned us as to their strength and sufficiency of arms, and we knew besides (that) those who had before us gone there had been killed by them and they had taken whatever they wanted from that boat.

effort; *nakatayato dana u araw*, the sun has already risen and is burning hot.

malakám, most often used to express strong desire, but applicable also to other strong affections, as, in this instance, violent fear.

6. *miñirua*, Mahatau pronunciation of Basco *minirua*, perf. of *mirua* (under).

kauyud, truth, genuineness, of *uyud* (see under 2).

kaidaud, being far out at sea; cf. *maidaud* under 5.

kapakañit, daring; cf. *chinañitan* under 4.

rumanun, radical *ranun*, idea of proceeding to another place.

chinanggal, perf. of *tanggalen*, that which is told to somebody in advance; cf. *pinatanggalan* under 4. Note *t* changing before *i* to *ch*.

kaheyet, strength; also the form *kayit* is found: *kayeten u kuman*, a glutton; *ichait mo u dima*, press the hand; radical *ait* (*ayit*).

kanu, and; probably *kan* plus an enclitic *u*.

kanaub, sufficiency; *manaub*, sufficient.

vuhó, *vuhú*, arms of any kind; *mayvuhu*, arm one's self.

kapanmu, cf. *mapanmu* under 3.

nanma, from *nanuma*, what is first.

kañiamen, from *kan* plus *iamen*, here: "than we."

daw (*d* plus *aw*), in or to that place, there.

ñidiman (Basco: *nidiman*), perf. of *dimanen*, object of killing.

kahap, radical *ahap; manghap*, take; *ahapen*, object of taking.

ichakey, object of desire.

7. As dawa naori u pinakayapuan nu kavata ku sia dyira du atavu a kasakáy cho u umunot aya:

(1) "Nu manumma a pariñen ñio am nu kapakaru ñio sia du lakasan u ahahawen ñio a ichahuhu da, akma su pulak, vuhawan, anmana angu pa a bayuan ñio as kapangay ñio sia du dyinahahawa a yanan nu bayuan.

(2) "Nu mapéyya ayuayub ñio a maidak am unayen ñio tapianu dyida sinchad u kaivatán ta a mapanmu da abú su vuhó.

(3) "Nu katanggal ñio su

7. And from that (came) the inducement of my addressing to them, to all my shipmates, this the following:

(1) "The first thing to be done by you is to take out of the chests the objects you suspect to be desired by them, such as silver, gold, or whatever you would be sorry to lose and to put it in a place not suspected (of the presence) of objects it would be a pity to lose.

(2) "Your best white clothes will be put on by you in order that they may not recognize our being Batanes whom they know to be without arms.

(3) "Prepare wooden clubs

7. *pinakayapuan*, radical *yapu*, origin; *Yapu ka dinu?* From where you?
kavata, cf. *vatahen* under 5.
kapakaru, cause to get out.
lakasan, chest, box; cf. Ilk. *lakasa*, same meaning, probably fr. Sp. *la caja*.
ahahawen, object of judging, believing, suspecting; perf. *inahahaw;* one who judges, etc., *mangahaw*.
ichahuhu (*ichahoho*), object of desire, perf. *chinahuhu;* alternative form: *ihuhu*, perf. *nihuhu;* one who desires, *mahuhu*, perf. *nahuhu*.
akma, used in comparison: as, like, similar to.
bayuan, radical *bayu*, pity felt over what can be, or is, lost; hence *bayuan* object of such pity.
dyinahahawa, from *dyi* plus *nahahawa*, unsuspected.
yanan, cf. *kayan* under 1.
mapéyya, best; *mapia*, good; *mapipia*, better.
maidak, white; synon. *marelak;* of persons: *maray, madadas*.
unayen, object of putting on in dressing; *mangunay*, dress one's self.
sinchad, radical of *masinchad*, know, recognize; *Angu kasincharan mo diaken?* How do you know me?
katañggal, cf. *pinatañggalan* under 4, and *chinanggal* under 6; note the abundant use made of abstract nouns with prefix *ka-*, especially the *nomina actionis* (with perf. in *china-*); cf. under 1: *kayan, kapihœxteng;* under 3: *kasñgen, kakarañgan;* under 4: *kadekéy, kadiman, kagchin;* under 5: *kamahep, kamaraw;* under 6: *katalamad, kaidaud, kaheyet, kanaub, kapanmu, kahap;* under 7: *kavata, kapakaru, kapangay, kaivatán*, and many others to follow.

vuhó ñio a kayo a dimipánaru kanu atdo a rangan, lukoy, kanu kapatuaw su vatu a lastre a maparin a irarayaw su sakayan da anu marahet u pariñen da.

8. (4) "Piahen sirava a sumakáy du aváng aya, as anu sumakáy sira am inulay nu Dios u kapandiman ta.

(5) "Arava u mandiman anu dichu pa a vinata kanu andyipa inahés dyiaken ta Cristiano ta." Katavuan namen a tao nu aváng am atdo poho kanu asa. Minaychatdo u tao nu aváng; nu asa poho am pachunungan da u aváng du atavu a mayanung a pariñen; akma su kapaibira, as kanu kadduan pa. Nu rua poho am micharua a mayviit du siri abú su pasakayen.

not longer than three spans, cleavers, and fetch stones from the ballast capable of smashing their boats if their acts (were) bad.

8. (4) "They are not permitted to come on board this ship, and if they come on board, it will be permitted by God that we kill (them).

(5) "Let there be none that kills before I have said so and (the question has been) referred to me, for we are Christians." The total number of us men on board the ship was thirty-one. The men of the ship were divided in three parts: ten were to look after the vessel regarding all necessary work, such as the turning the ship about and other things. The (other) twenty men were to divide in two parts and to go to the sides (of the ship to see that these were) not to be ascended.

dimipánaru, radical *ánaru*, long.

8. *piahen*, what is allowed, sanctioned; from radical *pia*, idea of good; cf. *mapéyya* under 7.
sirava, from *sira* plus *ava*, they not.
inulay, what is tolerated; radical *ulay*, idea of will.
kapandiman, homicide, slaughter.
ta, inclusive form of pers. and poss. pronoun of the first pers. pl.
dichu, from *di*, not, and *chu*, my.
andyipa, from *anu* + *dyi* (*di*) + *pa*, if not yet.
inahés, perf. of *iahés*, object of inquiry.
katavuan, from *atavu*, all.
minaychatdo, perf. of *maychatdo*, being divided into three parts; *ka-* or *icha-* before cardinals makes ordinals (*u ichasa*, the first, etc.) and *may-* or *mi-* before these expresses a division into so many parts as the cardinal denotes: *michatdo u takey aya*, this field is divided in three parts.

9. Du katayuka na naori am inahés ku dira anu mayunung aku a manyuku-yukud da anu akmay marahet u pariñen da dyiamen, anmana mian pa u mipapia pa kañiaken a maparin abneken a machitadi: am vinata da u kapayunung ku a manyukuyukud da; as dawa naori u vinatán ku sia dira u umunot aya:

(1) "Du kayapu na dyiñio nu masaray ñiaken du akmaya sia a kavaklan ta am arava u dyiñianuhed du atavu a vatahen du dyiñio.

(2) "Mitavu ta a makey a maviay am anu sinu u mavuya

9. At the conclusion of this I inquired from them if I was to continue commanding them if any injury (should be done) by them to us, or if there were one better than I, whom they might appoint as (my) substitute: their declaration was (for) my continuance as their commander; and, upon this, what I told them was the following:

(1) "Since you have confidence in me in these straits of ours, let there be none who does not obey everything I tell you.

(2) "We all of us wish to live, and if one is seen by me who

pachunungan, from *unung*, idea of caring for something.
mayanung, being convenient.
kapaibira, radical *bira*, probably from Sp. *virar*, to tack.
mayviit du siri, appears redundant, since *mayviit* is "to go to the side" and *siri*, side.

9. *mayunung*, remain, continue; cf. under 5: *nu salawsaw am mayunung pa.*
mipapia, one who improves; here "one who surpasses me;" cf. *piahen* under 8.
marahet u pariñen da, lit. bad the deeds their.
abneken, what or who is appointed; *mamnek*, who names; cf. *abnikan* under 3.
machitadi, radical *tadi*, idea of relieving.
vinata, perf. of *vatahen*, what is said.
vinatán (second *a* long), perf. of *vatán* (*vata* plus suffix *-an*), same meaning as *vatahen*.
kavaklan, radical *vakel*, trouble, difficulty.
dyiñianuhed, from *di* + *nia* + *anuhed*, lit. "not-his-obedience."
mitavu, from *atavu*, all. Prefix *mi-* in Ivatán appears to bring the sense of the radical in still closer connection with the carrier of the predication than is generally the case with affix *um* with which *mi-* may be related.
makey, one desirous.
mavuya ku, object of my seeing.

ku a umiso du contra as pakasakayan da u sinmu na am yaken u rumanis a umdiman sia du horas auri."

10. Du kavuya ku su kapanhavas nu kapáw kanu kamu namen atavu am miparakúx u kamu ku, tanu kaduan dyiamen am makapaidyiwadyiway pava du kapanghavas nu kamu, as vatán ku sia dira u kadyi da amuan ta du kavuya su sakayan da a mipadekéy kanu sakayan namen am katadkan nu sumayap dira, as nu dyinayap, am mitavu sira a manahan du ngalab a mauhamek a talahen nu tumanggal sira. "Aranu mian dyiaten u rakúx a kamu

recedes before the enemy, and gives cause to their invading (lit. 'mounting') his assigned post, I personally shall kill him at that time."

10. Upon my seeing the excessive despondency and fear in all our midst (lit. "of all of us"), my alarm increased and some of us were motionless with excess of fright, but I told them that they be not afraid for, evidently, their ships were small against our ship so that, unless they (could) fly—and (they surely) could not fly—all of those that passed the gunwale would be easy to be caught by him who was prepared for them. "Although there is

umiso, cf. *mipaiso* under 2.
contra, Sp. "against;" accepted in Ivatán as meaning "enemy."
sinmu, cf. *mapanmu* under 3.
rumanis, who acts personally; radical *ranis*.
horas, time; from Sp. *hora*, hour.
10. *kapanhavas*, radical *havas*, idea of exceeding.
kapaw, dejectedness; radical *apáw*.
miparakúx, radical *rakúx*, great; Ilk. *dakél*, same meaning.
makapaidyiwadyiway, radical *dyiway*, idea of moving.
pava, from *pa* + *ava*, no more.
u kadyi da amuan: u seems to have, here as in other instances, the force of introducing a succession of words as one whole object of thought, this being moreover rendered possible by prefix *ka-*, of *kadyi*, and suffix *-an* of *amuan*, comprehending *dyi da amu* into a sort of abstract expression: "their being without fear."
ta, because.
katadkan, excepting; radical *tarek*, idea of distinction; cf. *Patadkin mo sira*, Put them apart; *Pinatarek ku na*, I have already put them apart.
manahan, one who passes through a door, street, etc.; from *rahan*, way.
ngalab, edge, sharp edge of a knife; in ships: the gunwale.
mauhamek, what is easy.
talahen, what is caught (with the hands, etc.) from afar; radical *tala*.
aranu, although.

am ipavuya tava u kamu as pariñen ta u kakmay dyinanggalan sira kanu kadyinangán nira as nu ravel am patuawen ñio as kapaysunata ñio, as iñio a kahénakan am micanción kamu."

11. Du kachidib namen dyira du sakayan auri am mipasngen daná sira, as patuawan da su vodiadong as kalup da dyia su minaypisa am nañieng sira maywayan u dadua ori a kasakayan su dekéy as nu asa dyira am navidin pa a maiwayam, as nu asa am kuminatuvu a mipangay dyiamen.

among us great fear, we (must) not show the fear, but act like not preparing for them and not paying attention to them; and bring out the violin and play some sonatas, and you, young fellows, you sing."

11. Upon our seeing those in the boats coming nearer, they [that is, our crew] brought out the vodiadong and blew it once, when of a sudden the two boats stopped a little, though only one of them remained tarrying, while the other proceeded coming towards us.

u kakmay dyinanggalan sira, "a manner of unconcernedness as to them;" cf. above: *u kadyi da amuan.*

kadyinangán, from *ka-dinangá-an; dinangá*, not pay attention, from *di* (not) and a radical *sangá*, having probably the original meaning of "branch;" cf. *mapasangá*, be able to do something for not being impeded by other occupations; *dina pasangá*, can not do it; *dina yakin sinangá*, he paid no heed to me.

ravel, from Sp. *rabel*, a kind of small violin.

patuawen, what is caused to come forth; radical *tuaw*, idea of issuing.

kahénakan (or *kahóenakan*), a collective form of *kanakan*, young people.

micanción, from Sp. *canción*, song.

11. *kachidib*, radical *tidib*, idea of looking; *tibi pa!* (or *tib pa!*), look at it! *tiban*, what is looked at.

patuawan, used here alternately with *patuawen* (q. v. under 10); there seems to exist in Ivatán speech a certain indifference as to the use of derivatives in *-en* or *-an*.

vodiadong, a big conical shell, about a foot long, used as a horn for calling people to assemble.

maywayam, who is chatting without accomplishing anything.

kuminatuvu, perf. of *kumatuvu; kumatuvu ka!* Pass on! the formula used to invite somebody into the house: "Come in!"

DU KAWARA DA DU AVÁNG ICHADIMA KA ARAW

12. Du nakapakarapit darana du avánng am pakapian namen dana dyira su Dios nu chirin nu español kanu tagalog am chinbai dava. Kahes da ñia anu iangu kami, nu chirin da am mapanmu u rayarayay na ta machitbin du chirin nu ivatán. Nu chinbay namen am: "Tagalog kami." Nu vinata da: "Iami kami." Du kuanasaori am mapatuaw sira su asa ka tavayay a ranúm. Yamen a taytoo a mapnu nu kawaw am vinata namen u kaskéx namen ñia kanu kapilenlen namen.

AT THEIR ARRIVAL AT THE SHIP THE FIFTH DAY

12. When they had arrived at the ship, they were greeted by us with God's cheer in Spanish and Tagalog, but there was no answer from them. They asked what people we were, in their language, and we understood parts of it, for (it was) similar to the speech of the people of Batán. Our answer was: "We are Tagalog." They said: "We are Iami." Meanwhile they had brought forth a calabash of water. We were very thirsty, yet we expressed our refusal of it and shook our heads.

12. *nakapakarapit*, radical *rapit*, idea of arriving, nearing.
pakapian, radical *pia*, good; the ordinary greeting in the Batanes is *Kapian ka nu Dios!* about: The grace of God to you!
chinbay (in Basco: *tinbay*), perf. of *atbayen*, what is answered; *tumbay*, one who answers; radical *atbay*.
dava, from *da*, their, plus *ava*, not.
kahes, radical *ahes*, idea of asking.
iangu, from *angu*, what, with tribal prefix *i-*.
rayarayay, radical *rayay* (Basco: *dayay*), part; *kahœrayay*, companion in going somewhere.
machitbin, said of things which lack little to be equal; possibly from radical *tidib*, cf. *kachidib* under 11.
taytoo, idea of finding one's self, of being. This idea finds expression likewise by *are* (*ara*) and *mian:* "It is here" may be *are, mian*, or *too dia*.
mapnu nu kawaw, lit. "full of thirst."
kaskéx (*kaskóex*), radical *askéx*, idea of unwillingness.
kanu, and; also *kan* occurs; these are used between common nouns, as in *inapuy kan* (or *kanu*) *among*, rice and fish, or to connect sentences as above. At the beginning of a sentence mostly *as* is used: cf. *As dawa* etc. at the beginning of paragraph 2. Sometimes *as kanu* is said. Between personal names *kani* is found: Peter and John, *si Pedro kani* (or *kan*) *Huan*.
kapilenlen, radical *lenlen* (*linlin*), idea of shaking (the head).

13. Nu kapatalamad su ichaskéx am chingpóex da u taydidekéy daná naluto nu ranúm du angaangang sira uri as kapayadis da sia du asa ka dyidiaw as katurux da ñia dyiaken as inuman ku dyia as kapabukbuk ku na su rayay na a mabuya da; am nauri u pinabhesan darana su ranúm auri. Minakalu u kapatuaw da su ñioy a iturux dyiamen am ichakey namen ava. Vatán ku su kapatuaw da su ñioy a masadít as mian pa u vonut a mauhamek as patuawan da sia a ipavuya sira, am nauri u pinabhesan darana sia.

13. In demonstration of (our) unwillingness they [that is, our crew] gathered the very few drops of water in all those pots and filled them into a bottle and gave this to me, and I drank it, and part of it I spilt before their eyes, and this made them cease (offering us) that water. Promptly they brought forth coconuts to give to us, but we did not want them (either). I told (our men that) they bring out some coconuts (of ours), but these were difficult (to get at), and as there were also husks of coconuts and these were handy, they brought them out to show them, and that caused them (the Iami) to desist.

14. Nu maday du patuawen da sira ori am vatahen da:

14. With each object of those brought forth by them they

13. *chingpœx*, perf. of *akpœxen*, what is gathered together, joined; *kakpœxan*, congregation.
nalutò, drop, stated to be a Mahatau localism for the more general *nayeteng* of same meaning.
angang, large waterpot; *angaangang*, a number of such; as here, plurality of articles finds often expression by reduplication minus the last sound: cf. *ayuayub* (7), *rayarayay* (12), *kani-kanen* (15).
kapayadis, radical *adis*, idea of filling over liquids.
dyidiaw (Basco: *didiaw*), bottle.
katurux, radical *turux*, idea of giving.
kapabukbuk, radical *bukbuk*, idea of upsetting; *Pabukbuken mo!* Upset it!
pinabhesan, radical *abhes*, idea of ceasing.
masadit, what is difficult; contrary of *mauhamak* (cf. under 10), what is easy. The nuts were probably stowed away where they could not be got at without a sailor leaving his post for some time.
vonut, the fibrous husk of the coconut.
14. *maday du patuawen*, each of the brought out objects; *maday du tao*, each person; also *mangday* occurs: *mangday su vuhan*, every month.

"Ié!" du katurux da ñia dyiamen u angu siraya mitutuaw, am isanga da sirava nu kaduan aya dyiamen ta mayfirme sira maycanción kanu kapayravel da. Tayuka sira ori am mirua sira a mapatuaw su among a you am minakalu u kapatuaw namen su among a you ta minadpon pa u pawpaw namen a you. As du kavuya da sia am nañieng da a pabhesen, as kapatuaw da su viñivex kanu bilaw, am arava dyiamen, as pavuya namen dyira u tayunkad nu kaskéx namen ñia.

said: "Ié!" in handing out to us these things as they came out, but no heed was paid them by the rest of us who went on singing and playing violin. When those (things) were finished, they yet brought out shark-fish, but quickly we too got out shark, for we had still plenty of sun-dried shark. And upon seeing this they at once desisted and got out bananas and winnowing baskets which we had not, but we showed them signs of our unwillingness regarding them.

15. Nu nadpon sira ori a kanikanen a iturux da dyiamen am arava u pakayapuan nu kaskéx namen ñia as rakúx u katanggal namen sia a ichamu

15. As to those plentiful provisions which they offered to us, there was no (other) reason for our dislike for them but our great preoccupation

ié, evidently an interjection accompanying the exhibition of objects, equivalent to Ivatán: *Tiya!* Inibaloy: *Iay!* French *Voici!*

angu, thing; see under 4.

isangá, cf. *kadyinangán* under 10.

kaduan, the other one, or ones; cf. *mirua* under 2. Ilk. *kaduá* companion.

mayfirme, cf. *nayfirme* under 2.

tayuka, term expressing the idea of finished in general.

you, another spelling of *iú* or *iyú*, shark (see under 3).

minadpon, stem *adpun* (also *apon*), idea of accumulation, plenty: *nadpun a manumanúk*, a flock of birds.

pawpaw, name for the operation of cutting open and spreading out a fish for sun-drying.

viñivex (or: *viñivœx*), general name for bananas; *tul* (long *u*) *nu viñivex*, banana shoot; a special kind of banana is *soten* (or: *suten*), strips of the leaves of which give material for different articles of primitive dress comprised under the name of *sut* (long *u*); cf. Tag. *suot*, dress.

tayunkad, sign; what bears a sign: *matayunkad;* what is to be signed: *tayunkaran.*

15. *kanikanen*, provisions, eatables.

pakayapuan, motive; radical *yapu*, origin.

katanggal, radical *tanggal*, idea of anticipating, preparing; cf. under 4.

ichamu, cf. *kamu* under 4.

anu nauri u pakayapuan nu rarahan da a sumakáy dyiamen anmana mian pinangay da a veneno. Sichanguriaw am mangdaw daná sira su pinuspús a kedked da am makaktu kami ava. Du kadí namen a makaktuan dyira su pinuspús am nauri u tungduhen da a ichakey a panghapan u vidad (lona) kanu kapanahes da su pulak am arava u chinurux namen dyira. Du kabu nu maktu namen dyira du ichahoho da ya am kuminaru sira a mangay du rarayay da ori.

16. Du nakarahan nanaori am vinata ku dyira du kasakáy chu sira ori: "Taori, sira

which made us fear that these (articles) be but a way for their coming on board, or that poison had been put into them. Presently they asked us for ropes to make fast (their boats to our ship) but we did not consent. Upon our not granting them the ropes they showed, by pointing their fingers, the desire to obtain the sail (of our ship which was of canvas) and they asked for silver, but nothing was given them by us. Nothing being granted them by us of their desires, they went away to their companions.

16. This having passed, I said to my shipmates: "Look there, they are gone, but we

rarahan, way, road, here: pretext.
sumakay, cf. *pasakayan* under 2.
pinangay, perf. of *pangay*, radical *angay*, idea of going.
veneno, (Sp.) poison.
sichanguriaw (or: *sichangu yaya*), now at once.
mangdaw, term for begging if done among equals.
pinuspús, rope; radical *puspus*, idea of twisting.
kedked, idea of tying one thing to another.
makaktuan (*makaktu*, *maktu*), radical *aktu*, idea of granting a request. For the force of "*Du ka. .*" introducing the phrase "*di namen a makaktuan*" ("not our granting") cf. "*u kadyi da amuan*" under 10.
tungduhen, radical *tungdù*, idea of indicating by pointing the finger.
panghapan, radical *ahap*, idea of seizing, taking.
lona, Sp., canvas.
kapanahes, radical *ahes*, idea of begging.
pulak, silver. Cf. my paper "Ein ethnogr. Bericht ueber Botel Tobago" (p. 187) anent the value put by these islanders on silver.
ichahoho, radical *hoho*, idea of desiring.
kabu, from *ka* + *abu*, there is not. Cf. under *makaktuan* above.
rarayay, see *rayarayay* under 12.
16. *nakarahan*, with preceding *du* and following *nanaori* this phrase may have come to be accepted as equivalent to our "thereupon;" I have translated it more literally; stem probably *rahan*, way.

kuminaru am masarasaray tava as talamarin ta sira, ta mapia anu ara siranchi a makaraya daná am anu ara da sira iangay a tawagan u raray da ori, am marahet anchi u pariñen da naori as kanatunan na anu mahoerayay sira a mipaye dyiaten as kapaisiay danchi a mayviit du aváng aya, ta dyihammo u kaiyán nu ichakey da a pariñen a marahet dyiaten."

17. Naori am dekéy u nakapisisirin da as kapirua darana a mayvidi a nayrayay a mipayi dyiamen as mavawavawa pa sira am maysiay dana sira a mayviit anchi du sakayan namen. "Du kataytoo da a minarin su chinanggal ta a umanam a pariñen da am iñio a ruapoho am micharua kamo a

must not be confident and must observe them, for well they may be going ashore hereafter, yet, if they are going to call their companions there, bad will afterwards be their deeds, and especially so, if they go together in coming towards us and then separate so as to go to both sides of this vessel, for there exists certainly the wish to do evil to us."

17. (As for) those (islanders) they had some little talk and at once they again returned keeping together as they came towards us, and when they were yet a little distant, they separated so as to go then to both sides of our ship. "Since they are doing what we expected to be their future acts, you

dyira du kasakay chu sira ori, lit. "to them, to my shipmates they there." No attempt is made by me to render in the English text the abundant use made of demonstrative particles in Ivatán.

taori, look there! Cf. *Tiya!* Look at this! *Tauri daw!* There it is! *Tauri diá!* Look, here it is! etc.

masarasaray, one who trusts.

tava, from *ta*, we (incl.) plus *ava*, not.

mapia anu, good if.

siranchi from *sira*, they, plus *anchi* (Basco: *anti*), afterwards.

makaraya, cf. *nayraya* under 4.

kanatunan na, especially; possibly from a radical *atu*, cf. Tag. *umato*, make up one's mind.

mipaye, radical *ai* (pron. *a-i*), idea of coming; derivatives of this radical are written in the Batanes generally with *y* for expressing the glide from *a* to *i*, and often with final *e* for *i*: *mayi kaye*, *kakaiyan*, etc.

kapaisiay, act of separating; radical *siay*.

danchi, from *da*, their, and *anchi*, afterwards, then.

dyihammo, certainly; an alternative form is *dinghamu*.

kaiyan (*kaian*, *kayan*), existence; stem *iyan* or *ian*, idea of being in a place; *Mian daw si Pedro?* Is Pedro there? *Ara dinu u ianan nu vahay mo?* Where is the location of your house? Cf. *kayan* under 1.

mangay du binenek kaichi a lugar ñio. Sira u grumetes am natalangpús dana sira du siri nu aváng a malit su kavawavawa a mipondan du garrote a dyida vuya nu contra."

18. Du nakawará darana am mavuyvux a pinarin da u kapachinadnad da du aváng a tumidib du pakasakayan da, as du kabu nu mavuya da a pakasakayan am naori u vinata da u kapakaraya namen ta arava u manamsam, manulib, as kanu katungdo da su hañit. Nu vinata nu asa dyira am: "Makaraya kamu ta mian sira u bagu, manúk kanu kaddin." Nu mavuya a chinaru da am nu kavuya da su katanggal sira

twenty go back to your previously assigned stations. The young sailors are to stand in file at the side of the ship at equal distances and carrying a club in their hand that must not be seen by the enemy."

18. When they had arrived, the only thing they did was to be close to the ship looking for a means of coming on board; and when they did not see the possibility to come on board, they said that we should come on shore for there were no pillagers, sorcerers, and they pointed with the finger to heaven. The words of one of them were: "Come you to the shore for there are pigs, chicken, and goats." What was

17. *nakapisisirin*, radical *sirin*, idea of speaking; *sirin* is used only joined to affixes, while the synonymous form *chirin* occurs also alone.
mavawavawa, radical *vawa*, idea of distance.
kataytoo, cf. *taytoo* under 12.
ŭmanam, probably prefix *um* before a radical *anam* which appears to refer to "what is yet to come," as well as to "what is anterior" to such coming event; cf. *Too pa manam*, it is yet to come; *kanam nu kauyab*, before supper.
binenek (or *binnek*), perf. of *abneken*, object of naming; cf. *abneken* under 9.
kaichi (or *kaiti*), before, previously.
lugar (Span.), place.
natalangpús, arranged in file.
malit, radical *alit*, idea of being equal.
mipondan, who carries something in the hand.
garrote (Span.), cudgel, bat.
18. *nakawará*, cf. *minawará* under 1.
mavuyvux, single, sole.
kapachinadnad, cf. *machinadnad*, being so close to one another as to touch each other.
kabu, see under 15.
manamsam, radical *samsam*, idea of pillaging.
manulib, sorcerer, poisoner; cf. *masulib*, wise, clever.
as kanu, cf. *kanu* under 12.

ta sira u grumetes a machunong auri du sakayan a piparaparawatan da u rarakúx sira a vatu a pasapaten du palapala.

seen to be the motive of their going away was when they saw the preparations for them, because the sailors who guarded the ship passed from hand to hand big stones to be put on the gunwale of the vessel.

19. KAPARIÑIAN NU SAKAYAN KANU TAO

Nu sakayan am akmay falua su karakúrakúx a maisamorong a matarem as kanu makarang su lachid a mañima du pañivichivan, machideb du regala nu pontin. Nu mian pa a hurán da am kayu a mintíd a chinarin kanu vatu a akmay valachinuk su karakúrakúx. Sira u tao am arava u laylay da as

19. THE MAKE-UP OF THE BOATS AND THE MEN

The vessels are like a falua in size, both extremities sharp and with high (stem and stern-) posts which rise over the waist (of the boat) and equal in height the gunwale of the pontin. The cargo which they also had were sticks, each sharply pointed, and stones of the size of a valachinuk. The men had

hañit, sky, heaven. On the religious beliefs of the islanders of Botel Tobago see my paper cited under 15.

sira u bagu and the following *su katanggal sira, sira u grumetes* show the use of *sira* for indicating the plural.

chinaru, perf. of *icharu*, motive of going away.

machunong, who takes care of something.

piparaparawatan, radical *rawat*, idea of putting something into another's hand and thus serving him.

pasapaten, radical *sapat*, idea of putting one thing upon another.

palapala; the general meaning is that of an horizontal espalier for training vines; here perhaps some spars attached to the gunwale of the ship.

19. *kapariñian;* radical *parin*, idea of making.

falua Span., name given in the Batanes, as elsewhere, to open boats of European build for rowing and sailing.

maisamorong (*maisamurong*); radical *morong*, extremity, specifically stem and stern end of boats; *kasamorong*, one extremity; *isamorong*, inhabitant of one of the outlying villages.

makarang, radical *karang*, idea of high.

lachid, the stem and stern-posts of a vessel.

mañima (*manima*), what juts out.

pañivichivan, waist of a vessel.

machideb, what is equal in height.

regala nu pontin; regala (Span.), gunwale; *pontin*, term used by Spaniards and natives in the Philippines to designate a small sailing vessel, of more or less European build and rig, engaged in interinsular trade. Here the same as *panko*, q. v. under Title.

machivuyvux u sagut da as nu gugud da am akmay chintib a ñioy kanu kayán nu savadi da a pachipungan nu sinuhut da a dedekéy a malialit. Nu vidang da nu dadua auri a kasakayan am ruapoho kanu asa su kapahad o katao.

20. Nu makuyab nu nakapachisiay darana dyiamen nu Iami auri am naywayam kami pa su dekéy makayamot du karakúx nu kavakel ko nu kabu daná nu ranúm namen am pinahes ko sira u kasakay chu sira ori anu piahen da kanu makey sira a kumatuvu du Formusa am vinata da u kapainulay da dyiaken as nañieng namen dana a piweswesen u

no shirt and only a loin-cloth and the cut of their hair was like a halved coconut, and they had bandoliers for hooking on their knives which were small and uniform in shape. The number of men in these two boats was twenty-one souls or persons.

20. On the afternoon when those Iami parted company with us, we tarried yet a little on account of my great concern over our lack of water, and I asked my shipmates if they approved and were desirous of passing on to Formosa, and they said that they left it to me, and we at once turned the ship round to put her on a course to Formosa. At daybreak we

hurán, cargo of ship, wagon, etc.
mintíd, each, one and all; Mahatau really pronounces *minchíd*.
valachinuk, a small kind of sour orange.
laylay, shirt.
machivuyvux; radical *vuyvux*, cf. *mavuyvux* under 18; prefix *machi-* as a rule adds to the stem the sense of an activity exercised in association to others by way of a helper. I cannot say if the text conveys a sense of irony, as we might perhaps say: "Their nakedness was relieved by a solitary loincloth."
gugud, hairdress.
chintib, perf. of *aktiben*, object of cutting across.
savadi, band passing over the right shoulder and under the left arm.
pachipungan, hook or ring for an appendix; *pungan*, pillow.
sinuhut, knife, lit. "what is sheathed," from *suhut*, sheath. Cf. photographs accompanying Dr. Torii's Kōtōsho Dozoku Chōza Hōkoku, as also in his "Les Aborigenes de Formose," Journ. Coll. Sci., Tokyo 28 (1910) Art. 6, a few of which are reproduced in my "Inselkette zwischen Luzon und Formosa," Mitt. d. Ges. f. N. & V. Ostasiens, 11: 1.
o (Span.), or.

20. *makuyab*, afternoon; *kamakuyab*, yesterday afternoon; *kaminsakuyab*, the afternoon of the day before yesterday.

aváng a palunguhen du Formusa. Misexsexdang am masngen kami du dekéy a isla a masngen daná du Formusa. Nañieng kami a mamenek su gumchin a mañita su ranúm.

were near a small island[7] off Formosa. We at once appointed those who were to go from the ship to look for water.

ICHANEM A KA ARAW

21. Hora las 7 a. m. Du kapakarapit namen du asaori a kadekéy a isla am ñieng namen a pagchinen u bote as kagchin darana nu binenek auri a mangaud (anem a katao kanu asa ka piloto) as kapanaivi da nu asa ka angang a puranúm da, as du kasngen darana du tana am mian sira u mayhahaw a sakayan da ori a mitataaw as nu asa dyira du sakayan auri a hahawen a yanan nu cabecilla da am chinawagan na konó sira u kaduan auri a sakayan a masesngen dira a machivayat du

THE SIXTH DAY

21. At 7 a. m. Upon our nearing that small island we at once lowered the boat and down into it went those appointed as oarsmen (six men and one boatswain) and they took with them a large-mouthed earthen vessel for water, and finding themselves near the land there were a few boats of those fishermen and one of those boats was supposed to have on board the headman of them, for he called, as it was said, those other boats nearer to them to meet the (ship's)

kavakel; cf. *kavaklan* under 9.
piahen; see this under 8.
kumatuvu; see this under 11.
kapainulay; cf. *inulay* under 8.
piweswesen, radical *weswes,* idea of turning round, or veering a ship; synon. *birahen;* cf. *kapaibira* under 8.
palunguhen (radical *lungu*), what is caused to take a course.
mamenek; cf. *abneken* under 9, *binenek* under 17.
gumchin (Basco: *gumtin*), who goes down (here: from the ship); cf. *pagchinen* under 2.
mañita (Basco: *manita, manta, kumita*), radical *chita,* idea of searching; *chitahen,* what is searched for.
21. *ñieng,* same as *nañieng* q. v. under 5.
mangaud (*ma-nga-ud*), one who rows, radical *kaud,* oar; *kauren,* the boat as object of rowing.
kapanaivi, cf. *manaivi,* taking along something.

[7] This can be no other than the island of Samasana, 46 miles north of Botel Tobago.

bote, as du katalamad namen sira du aváng am uyud a rakúx u kamu namen anu pisarasarayan da sira, du kadyí namen pa a makapanmuan su pariñen da. As du kapitadyorong darana am mian u ranúm kanu kapapanmu darana nu kapia da tao.

22. Nu aváng am navidin a maybebera as nañieng a mirua a gumchin u bote a pinachisakayan ku kanu mayhahaw a tadyiranuman namen, as du kairaya namen daná am nañieng a machivayat dyiamen u cabecilla nu maytataaw as kavata na su kapachisakáy cho dia a makaraya as du kayán namen daná du iraya kanu bote am navuya da nu tao auri u karu nu tadyiranuman a ipuranum namen, a puranuman da nauri atavu as kangay da ñia du bote kanu angu pa sira a

boat; and upon our observing (this) we in the ship had a really great fear that they might be hurt by them, as we did not know their actions. But when they returned, there was water and they made us know the goodness of the people.

22. The ship kept veering about on the same place and at once the boat went down again, I embarking in it with a few of our water vessels, and when we came near the shore, there at once came to meet us the headman of the fishermen and he bade me embark with him to go to the shore and when we were at the shore and (with us) the (ship's) boat, those people saw the number of vessels to be filled by us with water, and they were all filled by them and brought to the boat,

mayhahaw, what is reduced in number.
mitataaw, fisherman; cf. *taaw* under 2.
hahawen, what is believed or opined.
yanan, place in which something or somebody is; cf. *kaiyan* under 16.
cabecilla (Span.), headman, foreman.
chinawagan (Basco: *tinawagan*), what has been called.
konó, it is said.
masesngen, what approaches; cf. *kasngen* under 3.
machivayat, who goes to encounter somebody.
pisarasarayan, who is hurt by somebody.
makapanmuan; cf. *mapanmu* under 3.
kapitadyorong, time of returning (to a place).

22. *navidin*, perf. of *mavidin*, remaining in a place: *Dios mavidin diño!* God abide with you! the salute on parting in the Batanes.
maybebera; cf. *kapaibira* under 8.
tadyiranuman, water vessel, a term apparently peculiar to the town of Mahatau.
kavata na su kapachisakay cho dia, lit. "his say (was) my joinedly riding in regard to him."

mavuya da a ichahoho namen am iangay da a chitahen as kangay da ñia du bote, vinachi kanu rakanen a kanen nu bagu.

23. Nu cabecilla nu mitataaw am naparutung nu kanin namen du vahay na uri, asa ka kawa a kulay a wakay, as kavata na sia du muestra dyiaken u kakan namen sia atavu a makasakasakayan, as kapirua na rana kañira u rarayay na uri a tumapang du kapangamong da. Navidin namen pa a katnayan u karaw namen du yavayava na uri ñiamen, as du nakatayuka namen a umaraw a navidin ako du iraya a namanda du nakakavus da a mavuavuhud a kuman as makuyab da-

and whatever else they saw to be our desire, they went and searched and brought it to the boat: firewood and green forage for the pigs (on board).

23. The headman of the fishermen caused food for us to be boiled in his house: a large iron kettle (full) of dried sweet potatoes, and he told me by signs this to be the food for all of us shipmates; and he with his companions again went on fishing. We stayed yet awaiting that (midday) meal from his hospitality for us; and when we had finished eating I remained on shore until they (all) had finished eating in turns, and it was already well into the afternoon when I

karu, from *aru* or *arru*, many.

kangay, from *angay*, idea of going and also of bringing.

vinachi (Basco: *vinati*), firewood; *mamati*, go for firewood; *vatien*, what is made into or used for firewood; another term is *irotong*, instrument for *rotong;* that is, cooking.

rakanen, green food, vegetables; *manakan*, who cooks such.

bagu, also *bagu a kuis*, pig. The panco carried a cargo of live pigs.

23. *naparutung*, compare radical *rotong* under *vinachi* above.

kawa, a large, panlike kettle of cast iron known under this name all over Luzon, etc. Fabro underlines the word in his MS., perhaps because he felt it as a loan word from the mainland Luzon.

kulay a wakay; by *makulay* are designated in the Batanes sweet potatoes cut in slices and sun-dried; also sun-dried fish; *wakay* is *Ipomoea batatas* in different varieties: *bayat, china, gabotero, lina, darbong, ballada*, etc.

muestra (Span.), sign, token, sample.

tumapang; radical *tapang*, idea of continuing.

katnayan; radical *naya*, idea of waiting; *Angu katnayan mo?* What are you waiting for? *Dicho a panaya*, I have no time to wait.

karaw, midday meal; *umaraw*, eating the midday meal.

yavayava, hospitality, kindness to visitors. Possibly glottal check after last *a*.

nakakavus; radical *kavus*, idea of finishing something completely.

mavuavuhud, who alternates; more common form: *mavuhuvuhud*.

ná am sumakáy aku du aváng as kakaru namen daná a mangay du Formusa, as mian kami du asa du rakúx a vaha na du kumaidauran am mawará u mapalispis a idaud as pirua namen a mayvidi as kapamatán namen daná.

24. Du kapirua namen daná a mayvidi am a las 10 p. m., as a las 2 a. m. am masinmo namen u Yami, as misexsexdang am arapava u mavuya namen a tana; as a las 7 a. m. am masari du kayukayaman su naychihat a dinamen a natanggal.

went aboard the ship and we set out going in direction of Formosa, and we found ourselves at one of the great promontories of the northern part when there came a squall from the north and we went back again and made for the Batanes.

24. When we were (thus) going back again it was 10 p. m. and at 2 a. m. Iami was in front of us, and at daybreak we saw no more land; and at 7 a. m. it had become dark in the northeast quite suddenly without our being prepared for it.

ICHAPITO A KA ARAW

25. Du nakaparanis na sia dyiamen am dichamipa a makapangariso, as nu mastelero du mayor kanu trenquite am naychamamchi du pangorsitan; du

THE SEVENTH DAY

25. When it struck us, we had not yet been able to reef the sails and the main and fore topmasts were about to burst . . . (du pangorsitan); when it was

vaha, rocky point, promontory.

kumaidauran, (more commonly: *kaidauran*) northern region, radical *idaud*, north, north wind. Infix *-um-* appears to add to the comprehensive force of *ka-an* a certain amount of motion: "all that enters into the idea of north."

mapalispis, said of the wind coming on with a striking force: squally.

kapamatán, radical *vatán*, Batán; *mamatán kami*, we are going to the Batanes; *pamatán ku niaya*, this is what I take with me to the Batanes.

24. *masinmo*, what is in front; cf. *sinmu* under 9.

arapava, from *ara pa ava*, there is more not.

masari, what is dark.

kayukayaman, radical *ayukayam* q. v. under 1.

naychihat, cf. *minaychihat* under 1.

dinamen, not our.

25. *nakaparanis*, cf. *rumanis* under 9. The meaning of radical *ranis* seems to be immediateness of action without anything intervening.

dichamipa, *di*, not, *chami* (*kami*) we, *pa*, yet.

makapangariso, possibly built on the Span. *rizo*, reef.

katayuka na naori am nañieng namen a hunen a dyi a nangay du lugár na as naybabat. Nu trenquite am navudintád a machitalin du butalón u berga a muvvu na a pasayapen u vidad a ipuha.

over [that is, the squall], we at once rolled up (the sail) which was not in its place and athwart. As to the foresail, the yard was turned over upside down by the side of the bowsprit and the sail was nearly blown out and carried away.

26. Du karahan nu chubasco am pisunungen namen du lugár na u vidad as kahoon namen su trenquite, am navuya ko sira daw u kaduan du grumete a maypuha nu tavatavayay sira ori, am vatán ku sia u kadyida a michawawan as ipuha dava u tavatavayay sira ori, am vatán da sia: "Michawaw kami ava as iturux namen a payawatan nu gumintos asa du kasakáy ta," as axsan ko ñia anu sinu u ngaran na am pinapanmo da dyiaken u ngaran na a si Gelasio Abas; ya am pinalsi nu vidad.

26. The squall past, we put the sail into its proper place and when we were rolling up the foresail, I saw some sailors throwing calabashes (overboard), and I told them not to make any mistake and not to throw away those calabashes, and they answered: "We are making no mistake for we give these as means by which to keep afloat to one of our shipmates who has fallen (overboard)", and I asked them as to what his name was, and they told me his name was Gelasio Abas; he was pushed (overboard) by the sail.

mastelero, topmast; *mayor*, main; *trinquete*, foremast, foresail; all Spanish nautical terms, the last being transformed into "*trenquite*."

naychamamchi, what is cracking or about to burst.

pangorsitan, I believe this to mean "halyard."

hunen or *hoonen*, object of rolling up.

lugár (Span.), place.

navudintád, turned the wrong way; cf. Tag. *baligtád*, same meaning.

butalón, Span. *botalón*, bowsprit; *berga*, Span. *verga*, yard.

muvvu na; the sense is that of almost, nearly.

pasayapen, radical *sayap*, idea of flying.

ipuha, radical *puha*, idea of throwing away.

26. *karahan*, cf. *nakarahan* under 16.

chubasco (Span.), squall, rain shower.

pisunungen (or: *paisunungen*); radical *sunung; masunung*, what is straight or perpendicular; *pasunungen*, objects to be placed in order.

27. Si changuriaw am maparin tava a iangay ahapin am amanda du katayuka ta a umnamunamu su naputot aya anayasan ta maparin tava a pagchinen u bote as nu pinarin ku am inaguhunan ku u lugár a yanan nu gumintos aori a tau, as kapakalukalu ku nu kanamunamu su trabaho aori a namanda du kaparin na a tairan su bote a pagchinen.

28. Du katayuka na naori a trabahuan am nañing a pagchinen u bote am uyud a masadít du kapahong na kanu kasalawsaw na pa, as nu kapuspús namen dyia su panda nu

27. At that very moment we could not go to pick him up, but only after our having finished fixing up the broken mast, for we could not lower the boat; so, what I did was to fix by the needle the place where that man who had fallen (overboard) found himself and I hastened the cleaning up of that work until the boat could be lifted up for being lowered (overboard).

28. Upon the conclusion of that work we lowered the boat at once and (this was) very difficult on account of the waves and also of the wind, but the effort we made to the limit of

tavatavayay, a certain variety of *tavayay;* that is, large calabashes that serve in the Batanes as receptacles, especially for carrying water.
michawawan, radical *awaw*, idea of erring, mistaking.
iturux, what is given; cf. *katurux* under 13.
payawatan, term applied to anything that serves to keep a man afloat in the water, such as a board, the trunk of a banana, etc.; radical probably *awat*.
axsan; cf. *kahes* under 12. *Aravay panahexsan ko*, there is nobody whom I might ask.
pinapanmo; cf. *mapanmu* under 3.
pinalsi, perf. of *palsien*, object of pushing.
27. *si changuriaw* (or: *si changu yaya*), an intensive form of *si changuri* (or: *si changu ya*), which latter means: now.
tava, from *ta*, we, and *ava*, not.
ahapin (or: *ahapen*), radical *ahap*, idea of seizing, catching.
umnamunamu, who repairs, cleans; *manamunamu*, what is clean.
naputot, perf. of *maputot*, what breaks (intr.); cf. *mamutut*, who breaks (trans.)
anayasan, mast.
inaguhunan, evidently built on radical Span. *agujon*, big needle (here: of the compass).
trabaho, Span. *trabajo*, work.
tairan (also: *tairen*), what is lifted with the help of ropes; radical *taid; manaid*, who lifts.

maparin namen du kasi namen nu tau aori a mavidin a mayaguanta a miay su karakuhan na du panda nu maparin na, as agchin nu manaub a mangaud kanu asa ka timonél a chinuruhan ku nu aguhon a pinapanmuan ku nu rumbo da as minangay sira a mauhamek su kavuya sia, abú su naparin dyira a namanda du nakapaitadyorong da du aváng.

29. Ya am suminakáy du aváng a uyud a mapáw su kachichiban as kanañieng na umuyog nu hoo na makayamot du kasaray a minalibre du rakúx a pinannganngan na.

30. Du nakarahan na naori am pinasakáy namen daná u

our strength (was) on account of our compassion for that man who was left struggling to save himself with the utmost of his strength, and there went down (into the boat) sufficient oarsmen and one helmsman to whom I gave the compass on which I showed him their course, and they went and found him easily, nothing happening to them until they managed to return to the ship.

29. He came on board the ship very dejected in appearance and suddenly his tears were flowing with joy at having been freed from his past great danger.

30. After this we hoisted our boat on board and turned to

28. *kapahong;* radical *pahong,* wave.
kapuspús; radical *puspús,* idea of exertion, valor; an old term for the supreme headman on the island of Batán was *mangpús.*
panda, limit.
mayaguanta; radical Span. *aguantar,* to hold out.
miay su karakuhan; karakuhan, body; radical *rakúx,* large, big; *miay* has the sense of "to protect, to save (one's life)."
agchin; cf. *pagchinen* under 2, *gumchin* under 20.
manaub; cf. *kanaub* under 6.
timonél, Span. for helmsman; *rumbo,* Span. for course.
minangay, apparently, beside *nangay,* a perf. of *mangay,* q. v. under 1.
nakapaitadyorong; cf. *kapitadyorong* under 21, where *pi* might be contracted from *pai.*

29. *mapáw;* cf. *kapáw* under 10.
kachichiban, appearance; cf. *kachidib* under 11.
umuyog; radical *uyog* (*uyug*), idea of flowing of water.
hoo (*huu*), tear; *mihuhuu,* who sheds tears.
kasaray, joy, happiness.
minalibre; radical Span. *libre,* free.
pinannganngan (pi-nan-ngan-ngan); radical *nganngan,* idea of bodily danger.

bote namen aori, as kapirua namen a umnamunamu su kaduan pa a nararayaw, as kapirua namen daná a tumapang du kapamidad namen a mamatán a namanda du nakapakarapit namen du vanwa du Mahatau aya; abú daná su miñirua a pannganngan namen.

repair some more damages, whereupon we continued again sailing for the Batanes until we reached the bay of Mahatau here without any further perils for us.

TAUSAN THE END

30. *nararayaw*, perf. of *mararayaw*, what is in disorder; radical *rayaw*, idea of disorder.
tumapang; see under 23.
kapamidad; radical *vidad*, sail.
mamatán; radical Batán; cf. *kapamatán* under 23.
vanwa, bay, landing place.
Mahatau, township on Batán; radical *hataw*, idea of floating on the water.
tausan; radical *taus*, idea of conclusion; syn. *kavusan*, from *kavus*.

LADYI A NANUMA

FIRST SONG

[For a better appreciation of the conditions under which songs like this and the following ones spring into life, a brief description was given at the beginning of this paper of the natural phenomena as well as of the economic and social life that characterize the Batanes. With an idyllic scenery inciting the minds of the islanders to poetic imagery, and pitiless storms decimating their families and destroying their fields, the keynotes of their songs can hardly be other than those to be heard from the selection of poetic prose here given. The following songs are somewhat literally translated, and it is left to the footnotes to do justice, as far as possible, to the literal sense of the words. At the end of each song a short explanation of its general tendency is found, while several details must necessarily remain obscure for reasons given in the introduction.]

Duvo a valayvayan du mayapitukunan pachidalawsawan nu tuminuduk nu muyvux a hahakawan!—Ipakaima kuava nu maduyusubit su pawpaw a binahachitan nguri am ipakaima ko u madiyasirap su pinanaudi a wakay ta su ahawen a di-

Oh beneficial valayvayan tree, resort of those who wish to refresh themselves with the fragrant breeze from the hills! Prize of my sole place of husbandry!—I appreciate not him whose only work is to angle at night for fishes to be dried in the sun; I esteem him who

mayavake nu vudik da nu kamanganakan. Anu kapaduduhad nu araw a umusuk umudi a mangates du niyapuan a maydoloken a mavaheng ta panalaway mo su komniay a kawalo du rapán nu dima mo. Anguhen a ivosuy su pagalitidieten ta mayango anu domibu ka du piratayan a umaliyalid nu mintid a kuminavus a pinitduan a kaunasan a pichaludisuditan nu hapa nu inulut a biyedbed nu rapung nu unas. Angu ichakaduyo mo! Du dimayunas a dumaray niya u kapangunut mo du tudung nu kaydian?

owns conterminous fields planted with the late sweet potato, for his children will likely not go hungry. When the sun is low in the sky, return from the field and proceed yet to the sugar mill to crush cane, and with the juice fill one of the large pots the sale of which will fill the palm of your hand with shining silverlings. What is the use of loud protestations of love? It were better you went to work in the field on the plain, attending to each single stalk of the sugar cane that has been completely bundled together for the third time with its drooping leaves that will serve to tie the bundles into a rapung. What laziness is yours! Being without sugar cane, do you expect to go after palek as a gift from a townsman?

duvo, in songs for *tuvo,* growth, utility, profit.
valayvayan, one of the species of trees planted to fence in fields.
mayapitukunan; radical *tukun,* hill; *pitukunan,* hilly region; prefix *maya-* often denotes: "smelling of," as in *mayaamong,* having a fishy smell.
pachidalawsawan; radical *salawsaw,* wind; *s* often changed to *d* in singing.
tuminuduk, what has become the prize, reward, or remuneration.
hahakawan, from radical *hakaw,* idea of working in the field.
maduyusubit, spending all the time in fishing.
binahachitan, what has been fished with the angle at night.
madiyasirap, what is contiguous.
pinanaudi, what has been planted at a late time.
wakay, Ipomoea batatas.
ahawen; cf. *ahahawen* under 7 in Voyage of the panko San Carlos.
dimayavake, not lacking contents; *vudik,* the belly.
kapaduduhad nu araw, position of the sun near the horizon either in the morning or in the afternoon
umusuk, what descends on an inclined plane.

umudi, who returns from the field to the town.
mangates, who crushes sugar cane; radical *ates; atsen*, the object.
niyapuan, vessel, container.
maydoloken, for *maysoloken*, an old expression used in counting money and meaning "what exceeds one peso;" *dua a soloken* is "two more than one peso," by *dua* being understood *dua a vinukœx;* that is, two half reals (of 6¼ centavos each). Synonymous with *vinukœx* is *kawalo;* that is, the eighth part of one *buhawan* (50 centavos).
mavaheng, black; also: a large earthenware pot of that color.
panalaway, what is held in the hand.
komniay a kawalo; komniay, shine, glitter; *kawalo*, see above *maydoloken*.
rapán, the palm (*nu tanoro*, of the hand) or the sole (*nu kokod*, of the foot); *dima* for hand is seldom used.
anguhen, often shortened to *angen*, what for? from *angu*, what?
ivosuy, what is told, proclaimed.
pagalitidieten, what gives a loud or queer sound.
domibu, for *somibu*, who starts out to work in the field.
piratayan, level lands; *ratay*, plain.
umaliyalid, observing and attending with care.
kuminavus, perf. of *kumavus*, what becomes complete.
pinitduan; as the height of the stalks increases, they are tied together three times in succession, being thus called *pinisaan*, once tied, *piniduaan*, twice tied, and *pinitduan*, thrice tied, respectively.
kaunasan, sugar-cane field, from *unas*, sugar cane.
pichaludisuditan, same as *paychaludyiludyitan*, what is hanging or suspended.
hapa„ green or dry leaves, and especially the stems of leaves; a more general term is *vuhung;* leaves used for plates: *daun;* fallen leaves: *inhay;* leaves of *Piper betel*: *samux*; still other terms in use.
inulut, binding material, such as vines, rattan, etc.; radical *ulut*, idea of pulling a wire, vine, and the like from some obstruction, or tangle.
rapung, about four bundles of sugar cane tied together by their crowns.
ichakaduyo, laziness; synonym: *ichatalakak*.
dimayunas, one without field of sugar cane.
dumaray, for *sumaray*, one awaiting or expecting.
kapangunut, the act of going after.
tudung, what is offered to those who take part in a work of neighborly help, such as thatching a house; generally *palek*.
kaydian (*kaidian*), townsman, from *idi* (*ili*), town, village.

The preceding song is in the way of an answer given by a girl to a young man aspiring to her hand. After an apostrophe to the field that forms her sole possession and on whose beautiful surroundings she apparently has set her heart, she turns to her suitor giving him to understand that she lays more weight upon assiduous work in the field, the only guaranty for the welfare of a family, than on wordy protestations of love. The language certainly lacks nothing in clarity of purport, though the mention of much time spent in angling at night might possibly involve a covered allusion to conduct on the part of her suitor little in harmony with his professions of love. We have here testimony for the soundness of ideals to be found among Batanese womenfolk, ideals taught them by the hardships of their life.

LADYI ICHADUA NA

SECOND SONG

Anu kapaypahabas nu adipasayaw du teyedted nu vahay nio kani ama mo am tawyen mo sira nu tatawi a talugun nu niyoy ta manumanuk sira ni apu ta du tuab nu vahay. Vuhawan du balugan, vuhawan du kadpidan, mirua ka du adán mo a katachiran ta sayangen ka nu sinukulan a palek a yapu du yawran a takey.

When the little birds adipasayaw pass under the eaves of your and your father's house, regale them (with palek) using as cup the half of the tiny coconut shell called talugun, for they are the birds of our Lord over the gables. Gold of the Orient, gold of the Occident, return to your former dwelling place and you will be treated with the well-seasoned palek of dark red color that proceeds from the fertile fields called yawran.

kapaypahabas, the act of passing.

adipasayaw, a kind of migratory birds passing the Batanes at certain seasons and staying only for a couple of months.

teyedted, space on the outside of a house comprised between the eaves, called *riyan*, and the ground.

tawyen; the original meaning would seem to be "palek to be poured into a coconut bowl (*tatawi*)," hence "the person, the guest, who is thereby to be regaled."

talugun, a variety of *Cocos nucifera* with very small nuts.

niyoy (*nioy*), *Cocos nucifera*.

tuab, the gable ends of the roof of the house (*vahay*); an old native suggested my translating "*apu ta du tuab*" directly as "our Lord God."

vuhawan (gold) *du balugan, v. du kadpidan; kadpidan* was stated to apply to the side of the island facing west, while *balugan* has the meaning of "the other, the opposite side of the island" where the sun rises; *ibalugan* are called on Batán those who live on the eastern side of the island, opposite to Basco which is on the west coast. Cf. Ilk. *baliu*, the opposite side of a river or of the sea. The evident stem of *kadpidan*, viz. *adpid*, has the meaning of putting something heavy on something else, so as to secure it.

adán, better *adaan*, old, former (said of objects).

sayangen; interpreted by some as meaning "object of sacrifice," it being understood that the sacrifice involves the shedding of the blood of a living being, such as a domestic animal, so that its blood may ensure the safety, say, of a new house or bridge, etc.; others translated the word directly with "object of moistening," a sense which, in connection with the blood red color of the special palek in question, leads back to the idea of a sacrificial act, little as this can be reconciled with the general purport of the song.

sinukulan a palek is palek that has been kept for a long time, perhaps even for years, in an earthenware pot that is sometimes buried in the ground, the liquid thus acquiring with age a dark red color; it is reserved for special occasions, such as the arrival of distinguished visitors.

yawran a takey; the general term for field, *takey*, specialized by *yawran*, which takes also the form *diuran*, meaning "place of fertile soil;" *Diuran*, proper name of certain fields near Basco.

This *ladyi a pinasinmo*, or significative song, was explained to be addressed by a young man of wealth and good family to a girl of like social position, asking her to receive him well when he goes to her house, and promising her that, if she would consent to marry him, she would be treated well as being of his own rank. As stated before, it is difficult clearly to trace the meaning of this kind of ancient songs through the words of the text.

LADYI A ICHATDU NA

THIRD SONG

Anu minamalugan ako as mangadpidan a komita su pidanuyan nu vanwa am dicho a dali ta mayabayabatuy sira u manayrin du naho matbung ava nu vinhuk a ganaysiwan ka si dahudù nu dimhés a umadimpurung di maidak a sungu.

Whether I direct myself to the coast over which the sun rises, or turn to the opposite shore, searching for a bay of placid waters, I fail to find it for the fishermen in the open take up their position in a line according to chosen landmarks and do not drop their small hooks destined for the (fish called) taysiw for the (one called) dahudú which is unceasingly pursued by the white sungu.

minamalugan and *mangadpidan;* cf. note to *vuhawan* under second song.

komita (*kumita*), *manita* or *manta*, who searches, looks for something; radical *chita* (Tag., etc., *kita*), sight.

pidanuyan, same as *katanuyan*, said of quiet unruffled waters; radical *tanuy*, smooth, gentle, placid.

mayabayabatuy, a poetical form of *mabatubatuy*, what is arranged or placed in a line; radical *batuy* (*vatuy*), idea of line, row.

naho, syn. *tuvidan*, what is used in an effort not to lose from memory; here: landmarks used by fishermen to give them the bearings of spots frequented by certain fishes; *naho* has besides the meaning of "man of trust," *tao a kasarayan.*

matbung, who drops something into the water.

vinhuk (syn. *inihuk, pinaysayran*), what has been bent or curved into a hook.

ganaysiwan, poetical for *panaysiwan*, a certain kind of fish hook used for catching the *taysiw*, from which it takes its name.
dahudú, name of a fish; said to denote also a poor man, a peasant.
dimhés, from *di umhés* (equal to *umhés ava*), not cease; radical *abhés*, idea of ceasing.
umadipurong, who follows, goes after.
di maidak a sungu; di evidently for *du; maidak a sungu*, white (really white spotted) fish *sungu*.

In spite of all efforts made, an exact interpretation of the details of this "significative" song could not be secured; it was stated to be meant as giving the position of a lover who is foiled in his intentions toward a girl by her being constantly followed by a rival.

LADYI A ICHAPAT NA

FOURTH SONG

Manlasal i hoo ko a dumañis ta padayapen ko si dadua a ka mata ko. Kumavus daná sira a makatining daná as makativaw dana du nuhud nu tukón, u minadkel a kadaisa ko, manga gayñapuan atavu. Anu inalialit na pakunó yatin ni Apu ta si Dios du kapaydayatao na diatin! Makasiasi dan ay i dumindang a hupes! Takunó i vutox nu adan a kalirang! Diako a mayatuhos a viltinen nu umudi as kulturen nu kumatuvo; mana akmay yaken u misinayaw a chinaṇan du nohos nu rarahan a pachidirungan nu minasbang du ama kanu ina.

My tears are falling with weeping as I raise my eyes. They all have been able to get on (in life) and have already reached the top of the mountain, my relatives of my own generation; all of them are as seniors to me. Would that our Lord God had made equal our destiny when he created us men! How pitiable is it to be the only blind grain among the seed! Look at the old kalirang vine! I am unable to make shoots as I am tugged by the people returning from the field and plucked by those going out to the field. I am like a leaf that has been used as a plate in eating and is cast into the middle of the road, the shelter of those bereft of father and mother.

manlasal, what falls like tears, grains, powder, etc.
i appears in songs as an alternative of article *u*.
dumañis, for tumañis, radical *tañis*, weep.
padayapen (for *pasayapen*) *si mata*, raise the eye; note *si* for *su*.
makatining, who is able to pass on.
makativaw, who is able to ascend.

nuhud no tukón, top of the mountain.

mmadkel a kadaisa (rectius: *kataisa*), clan of cousins.

gayñapuan atavu elders (ancestors, seniors, superiors) all; *manga* is the Tagalog pluralizing particle which, as some other Tagalog words, occasionally creeps into Batán.

inalialit, perf. of *alialiten*, what is made equal.

pakunó, term interpreted by some as "lot, fortune;" others give it as an expletive substituting another term not just remembered. Cf. Tag. *kuán*.

dumindang, for *sumindang*, what finds itself of a different kind among others of one kind.

hupes, blind grains of seed, blind nuts.

takunó, idiomatic for "look here:" *takunó iya*, look at this; evidently related to *pakunó* above; cf. "Viahe nu panko," sec. 21: *konó*.

vutox, kernel of a fruit; cf. Tag. *butil*.

kalirang, a vine found around Basco creeping up, and hanging down from, trees growing at the roadside, a handy binding material to passers-by; the *inulut* in the First Song; leaves eaten as a vegetable.

mayatuhos, what sends forth shoots.

viltinen (radical *viltin*), object of pulling with a jerk.

umudi, see this under First Song.

kulturen (radical *kultud*), object of plucking.

kumatuvo, who goes from the village to work in the fields.

mana, a particle inserted between clauses to indicate progress of the discourse; according to context: "and, then, but, now," etc.

misinayaw, what is thrown away; radical *sayaw;* cf. *sumayaw*, said of the wind carrying away something.

chinanan (radical *kanan*, root *kan*), what was place of eating; at large gatherings food is often placed before guests on large leaves serving as plates.

nohos nu rarahan, middle of the road.

pachidirungan, for *pachisirungan;* cf. *kasirungan* (radical *sirung*) place sheltered against sun, rain, etc.

minasbang, or *nasbang*, orphan; *michasbasbang*, who becomes orphan; radical *asbang*.

The preceding bitter lamentation over an ungrateful fate, sung by a poor female relative at some family gathering, is evidently meant to move the hearts of her better-situated cousins to grant her relief. It is original with the singer, and probably an improvisation. As stated before, everybody present at the gathering is expected to contribute a song, wherefore each singer closes his song with such words as these: "*Ahap as ralaw padaw, mo lipos, ta su dimayhanis nia*," meaning "Take up the song, you my cousin (or relative), so as not to give an unsatisfactory result."

KALUSAN

CHORUS OF ROWERS

Hesma hiawaway!	Bear a hand, boys!
Raunen ta u layag!	Launch the boat!
Ixbét du huvék	Passing out of the bay
Hawahawayen	We shall test you
Du mayavaha na	Off the point,
Imo, mo layag	You, little boat,
A mapsek a kayo.	Prudent timber.
Payhiñoré	From now on
Tadichokorí	Leave behind you
U vanwa mo	Your port
Pa vinohoré	And pass over

hesma hiawaway, two words of exclamation stated to be meant to inspirit the boat's crew for greater exertion. The words of this, as of all following lines, are, in chanting, either contracted or disrupted, their syllables lengthened or shortened, stressed or slurred over, so as to make them fit into the rhythm of the movements of the rowers which they accompany and accentuate. They become thereby to the greater part unintelligible.

raunen ta u layag, interpreted by some as "we make sail on the boat" cf. *daun*, leaf used as plate; *vidad*, sail; Tag. *layag*, sail); others point out *raunen* as an old expression for "launching a boat" and *layag*, repeatedly used farther on, as clearly meaning "boat." The radical *raun* occurs again, near the end, in *karaun* with the meaning of "discharge." The modern term for what is discharged or brought forth from an inclosed space is *aunen*.

ixbét du huvék; cf. *muxbét* (radical *axbét*), what goes out, issues; *huvék*, bay.

hawahawayen (radical *haway*), what is object of testing.

mayavaha; vaha, point, promontory.

imo, mo layag, lit. "you, you boat;" for the appealing repetition of the pronoun compare: *machiahuahuk kami dimo, mo Apu Dios*, freely translated: we beseech you, dear Lord God.

payhiñoré, radical *iñiod*, idea of lastingness; cf. *maiñiod ka a marahet*, you are bad all the time; the addition of an inorganic final *é* (*í*) is evidently meant to give more vigor to the corresponding jerky movement of the rowers.

tadichokorí, for *tadichokód*, turning of the back (*dichód*, Tag. *likód*) final *í* is inorganic, as above.

vinohoré; radical *vohód*, idea of passing over temporarily, borrowing; inorganic final *é*, as above.

Asa du vanwa mo	To your other landing
Du nachilubang aya	On the opposite side,
Daan mo a kaiwamán.	Your old familiar place.
Imo, mo layag,	You, little boat,
Hamuan mo ava	Do not desist
A di puspusan	From your endeavor
Si tinalalan.	To reach the destination.
Ibhés mo ava	Do not cease
Sapasapahen	To look for
si mambré nu isaak	The swift flow of the tide
Iyalakuíd	To go with you
Maasek du iraya	Towards the land
A vuyan ta sia	Where we shall find
Si madmay a huvék	That beautiful bay,
Punduan ta nia	The place to anchor
Mayor nu sadyit	With our best anchor,
Karaun ta diá	There to discharge
Chinarga nu layag	What the boat has loaded,
Ta rexdaimio	For they are awaiting you
Pachimabayagan	Impatiently,
Nu naypuyepenged	Everyone of those
Minapalibo.	Whom we left behind.

asa du vanwa, to the other port; *asa* (*isá*), one, often used in Philippine languages to mean "the other one," possibly due to its originally demonstrative character.

kaiwaman, radical *iwam;* cf. *maiwam*, who is accustomed.

hamuan, radical *hamu;* cf. *umhamu*, one desisting.

puspusan, what is strenuously endeavored.

tinalalan; radical *tala*, idea of prearranging.

ibhés, what is discontinued, perf. *binhes;* *umhes*, who discontinues.

sapasapahen, what is looked for; perf. *sinapasapa.*

si mambré nu isaak (*isāk*); *si* for *su;* *mambré*, old word for present *mamlí*, the strong, swift flowing of currents; *isaak*, cf. *ries*, under sec. 5 of Viahe nu panko San Carlos.

punduan, probably from Span. *fondear*, to anchor.

mayor (Span.), greater, greatest; *sadyit*, anchor.

karaun, cf. *raunen* above.

chinarga, a perfect obtained with infix *-in-* from Span. *carga*, load.

ta rexdaimio was translated "because (*ta*) awaiting you;" second word obscure, possibly containing *dimo* or *dinio*, prepositional cases of *imo*, *inio*, thou, you; the presence of *taruk da*, their signpost, might be considered.

pachimabayagan, cf. *mavayag*, tardy.

napuyepenged; for radical *penged* compare: *maypenged u ngaran nu takey*, each field has its name; *siraya a tatdo a ka personas am michakapenged dira u ka Dios*, those three persons are, each one for himself, God.

minapalibo, translated with "who or what has been left behind."

The preceding song, which contains a number of old words and old forms of words, now found only in songs and difficult correctly to interpret, expresses a pretty train of thought in a way that bears witness to the poetical disposition of the islanders. It was sung by the men who rowed me and my company in an open boat (called *chinerkeran*) on my return from Itbayat to Batán, some twenty miles over the high sea, a trip which makes the question of reaching Batán with the help of the current one of life or death. The same boat had less good luck on its following trip over the same route in January, 1909, when President Naqueta of Itbayat, with a number of other notables, bent on a return of my visit, were buried in the waves which only cast ashore a mast with torn sail and a water-logged trunk found among the cliffs of northern Batán.

ADDITIONAL REMARKS ON PHILIPPINE GYRINIDÆ

By Georg Ochs

Of Frankfurt am Main, Germany

Since I published my work on the Philippine Gyrinidæ,[1] I received still further material from the Philippines through the kindness of Prof. C. F. Baker, of Los Baños. The study of this material resulted in the records given here and the discovery of another new species of *Orectochilus*, the description of which is also given here.

Orectochilus oberthüri Régimbart.

Luzon, Benguet Subprovince, Baguio (*Baker*).

Orectochilus pulchellus Régimbart.

Samar (*Baker*).

Orectochilus discus Aubé.

Samar (*Baker*).

The singular formations mentioned in my last paper in relation to some specimens of this species from Mount Maquiling have now been recognized as belonging to the Laboulbeniaceæ, which are frequently found on gyrinid beetles.

Orectochilus samarensis sp. nov., male.

Long. 5 mm. Ovatus, parum elongatus, valde convexus, postice leviter attenuatus. Supra cupreo-aeneus, fortiter reticulatus (areolis rotundatis), ad latera punctato-tomentosus (pubescentia aurea), margine flavo. Infra piceo-ferrugineus, abdomine pedibusque rufescentibus, epipleuris flavis. Labro rufo, semicirculari, producto, postice nigrescente atque punctato-piloso, antice glabro et pilis longis flavescentibus instructo. Margine tomentoso in pronoto parum lato, postice paulo latiore, post oculos angustissime valde intus dilatato; in elytris latiore, valde ante medium semicirculariter et convexiter intus dilatato, suturam oblique circiter ad medium attingente; spatio nudo brevi subcordiformi, postice constricto et ad suturam late triangulari pos-

[1] Philip. Journ. Sci. 24 (1924) 81–86.

tea producto. Truncatura obliqua, paululum subsinuata, angulo externo obtuso sed distincto, suturali recto. Tibiis anticis elongatis, subparallelis, ad basin attenuatis, angulo apicali externo denticulato, parum producto sed rotundato, tarso sat lato, elongato-ovali.

Type, male, in my collection, from Samar (*Baker*).

Somewhat similar to *Orectochilus discus* Aubé, but easily to be distinguished from this and all other Philippine species of this genus by the very produced red labrum and the characteristic outline of the denudate portion of the elytra, which is shortly heart-shaped with rather sharp angles at the beginning of the posterior constriction, which is rather regularly triangular. The surface is of a coppery metallic hue and minutely but very distinctly alutaceous.

There is much affinity in characters with *Orectochilus vitalisi* Peschet[2] from Laos, which is probably the next allied species hitherto known. The female of *Orectochilus samarensis* is yet to be discovered, and will probably show some differences, especially in the outline of the denudate portion of the elytra.

[2] Opusc. Inst. Scient. Saigon 1 (1923) 14.

A CATALOGUE OF PHILIPPINE CARABIDÆ

By H. E. Andrewes

Of London, England

When G. A. Baer published his Catalogue de Coléoptères des îles Philippines [1] he enumerated thirty-six species and varieties of Carabidæ. Of these I have had to eliminate three, namely:

Pheropsophus ambiguus Dejean (= *occipitalis* MacLeay), never decisively recorded from the Philippines, though it may occur in the southern islands, as it is undoubtedly found in Borneo.

Scarites mancus Bouchard (= *idus* Olivier), a species which I believe to be confined to India and Ceylon.

Simodontus picescens Chaudoir, almost certainly an Australian species.

There remain thirty-three species and varieties known in 1886 as inhabiting the Philippine Islands. Up to the early part of 1926 a further seventy-three had been described or recorded, making one hundred six; to these I am adding, from my records of the numerous collections which have passed through my hands during the past ten years, a further forty-nine, making in all one hundred fifty-five species and varieties. These fresh additions are due in large measure to the energy of Dr. C. F. Baker, who has discovered many species new to the local fauna, fixed the exact localities in which others have been found, and collected much new material, most of which still remains to be dealt with. I have seen examples of nearly all the species enumerated, and have also had the opportunity of examining the types of most of them.

The arrangement in this paper of both genera and species is alphabetical, and at the end will be found indexes of both the synonymous and the subordinate genera, and of the species; in the case of genera the original spelling has been adopted. Only original references to both genera and species are given, and only Philippine localities are inserted, the latter being as full as possible; for further particulars my General Catalogue of Oriental Carabidæ, now in course of preparation, may be consulted, where full references and an extended list of local-

[1] Ann. Soc. Ent. France (1886) 97–200.

ities will be found. Synonyms, both of genera and of species, are printed in italics after the references, though in the case of the former they are not always the exact equivalent of the genus after which they are placed.

The meanings of the signs used are as follows:

* = The species is recorded here for the first time.
‖ = A preoccupied name.
† = The species quoted is other than that described by me.

ACUPALPUS LATREILLE, in Cuvier's Reg. Anim. ed. 2 4 (April, 1829) 391.

annamensis BATES,* Ann. Soc. Ent. France (1889) 272.
LUZON, Laguna Province, Los Baños; Mount Maquiling.

AEPHNIDIUS MACLEAY, Ann. jav. (1825) 23.

adelioides MACLEAY,* Ann. jav. (1825) 23, t. 1, f. 7 (= *sericeus* Zimmermann = *australis* Sloane).
LUZON, Laguna Province, Mount Maquiling.

simplex SCHM. GOEB.,* Faun. Col. Birm. (1846) 89.
MINDANAO, Zamboanga Province, Dapitan.

ALLOCOTA MOTSCHULSKY, Etudes Ent. (1859) 29.

cyanipennis HELLER, Philip. Journ. Sci. 23 (1923) 305.
MINDANAO, Bukidnon Province, Tangkulan. BASILAN.

viridipennis MOTSCH., Etudes Ent. (1859) 30.
MINDANAO, Agusan Province, Butuan. PALAWAN, Puerto Princesa.

AMBLYSTOMUS ERICHSON, Käf. Mark Brand. 1 (1837) 59 (= *Hispalis* Ramb. = *Megaristerus* Nietn. = *Thenarotidius* Sloane).

guttatus BATES,* Trans. Ent. Soc. London (1873) 327.
LUZON, Laguna Province, Los Baños; Mount Maquiling. MINDANAO, Surigao Province, Surigao.

quadriguttatus MOTSCH.,* Etudes Ent. (1858) 24.
LUZON, Laguna Province, Los Baños; Mount Maquiling.

ANAULACUS MACLEAY, Ann. jav. (1825) 22.

[*fasciatus* SCHM. GOEB., Faun. Col. Birm. (1846) 89.]

fasciatus var. **basalis** FLEUT.,* Ann. Soc. Ent. France (1887) 59, t. 4, f. 1.
NEGROS, Oriental Negros Province, Cuernos Mountains.

fasciatus var. **philippinensis** HELLER, Philip. Journ. Sci. 23 (1923) 302, t. 1, f. 2 (= *sericipennis* MacL. var. *philippinensis* Heller).
MINDANAO, Lanao Province, Iligan.

ANCHISTA NIETNER, Journ. As. Soc. Beng. 6 (1856) 523 (= *Paraphaea* Bates).

binotata DEJ.,* Spec. Gen. 1 (1825) 252 (= *discophora* Chaud. = *signifera* Bates).
LUZON, Laguna Province, Los Baños.

ANCHOMENUS STEPHENS, Ill. Brit. Ent. 1 (1827) 67 and 81 (= *Platynus* Steph. = *Agonum* Steph. = *Agonothorax* Motsch.).

quadripunctatus DEGEER, Mem. Ins. 4 (1774) 102 (= *nigrosericans* Heller).

LUZON, Benguet Subprovince, Mount Santo Tomas.

ANOPLOGENIUS CHAUDOIR, Bull. Mosc. 1 (1852) 88.

microgonus BATES,* Ann. Mag. Nat. Hist. V 17 (1886) 78.

LUZON, Laguna Province, Los Baños; Mount Maquiling.

APOTOMUS ILLIGER, Mag. Ins. 6 (1807) 348.

xanthotelus BATES, Ent. Month. Mag. 11 (1874) 95 [= ? *fuscus* Motsch. = *sumbawanus* † Heller (not Dupuis)].

LUZON, Laguna Province, Los Baños; Mount Maquiling.

APRISTUS CHAUDOIR, Enumération des Carabiques et Hydrocanthares recueillis pendant un voyage au Caucase et dans les provinces transcaucasiennes.

cuprascens BATES,* Trans. Ent. Soc. London (1873) 309.

LUZON, Laguna Province, Mount Maquiling.

ARISTOLEBIA BATES, Ann. Mus. Civ. Gen. (1892) 428 (= *Hoplomenes* Heller).

davaonis HELLER, Philip. Journ. Sci. 19 (1921) 529, t. 1, f. 3.

MINDANAO, Davao Province, Davao. SAMAR.

BEMBIDION LATREILLE, Hist. Nat. Crust. et Ins. 3 (1802) 82.

bakeri ANDR., Ent. Month. Mag. (1924) 197.

LUZON, Benguet Subprovince, Baguio.

niloticum DEJ.,* Spec. Gen. 5 (1831) 73 (= *hamatum* Kol. = *batesi* Putz.).

LUZON, Laguna Province, Los Baños.

BRACHIDIUS CHAUDOIR, Bull. Mosc. 1 (1852) 78.

crassicornis CHAUD., Bull. Mosc. 1 (1852) 80 (= *corpulentus* Chaud.).

LUZON, Laguna Province, Mount Maquiling; Mount Banahao.

BRACHINUS WEBER, Obs. Ent. (1801) 22.

luzonicus CHAUD., Ann. Soc. Ent. Belg. (1876) 68.

LUZON, Laguna Province, Los Baños; Mount Maquiling.

piceus CHAUD., Ann. Soc. Ent. Belg. (1876) 53.

Philippine Islands.

BRACHYCTIS CHAUDOIR, Ann. Soc. Ent. Belg. 12 (1869) 252.

rugulosa CHAUD.,* Ann. Soc. Ent. Belg. 12 (1869) 252.

MINDANAO, Lanao Province, Iligan.

CALLEIDA LATREILLE and DEJEAN, Hist. Nat. et Icon. Col. Eur. (1822) 132.

discoidalis HELLER, Philip. Journ. Sci. 19 (1921) 529.

MINDANAO, Davao Province, Davao.

spendidula F., Syst. Eleuth. 1 (1801) 184.
LUZON, Laguna Province, Mount Maquiling: Tayabas Province, Malinao: Nueva Vizcaya Province, Imugan.
splendidula var. rubricata MOTSCH.,* Bull. Mosc. 3 (1864) 238.
LUZON. MINDANAO.

CATASCOPUS KIRBY, Trans. Linn. Soc. 14 (1825) 94.

aequatus DEJ., Spec. Gen. 5 (1831) 452.
LUZON, Manila: Benguet Subprovince, Baguio. POLILLO.
elegans WEBER, Obs. Ent. (1801) 45.
LUZON. PALAWAN, Puerto Princesa.
facialis WIED., Zool. Mag. I 3 (1819) 165 (*teste* Bates).
Philippine Islands.
simplex CHAUD., Rev. et Mag. Zool. (1872) 246.
MINDANAO.
smaragdulus DEJ.,* Spec. Gen. 1 (1825) 331.
SAMAR.

CELAENEPHES SCHMIDT-GOEBEL, Faun. Col. Birm. (1846) 77.

parallelus SCHM. GOEB.,* Faun. Col. Birm. (1846) 78, t. 2, f. 5.
BASILAN. SIBUYAN.

CHLAENIUS DEJEAN, Spec. Gen. 2 (1826) 297.

bimaculatus DEJ.,* Spec. Gen. 2 (1826) 301.
Philippine Islands.
flaviguttatus MACL., Ann. jav. (1825) 15 = *binotatus* Dej. = *punctatus* || Chaud. (not Motsch.) = *maculifer* Cast. = *puncticeps* Mun. Cat.]
flaviguttatus var. guttatus ESCHSCH., Zool. Atl. 5 (1833) 26, t. 25, f. 8 [= *biguttatus* || Montr. (not Motsch.)].
LUZON, Manila: Laguna Province, Los Baños; Mount Maquiling. SAMAR.
[*guttula* CHAUD., Bull. Mosc. 3 (1856) 216.]
guttula var. cuspidatus HELLER, Philip. Journ. Sci. 23 (1923) 301.
LUZON, Laguna Province, Los Baños. MINDANAO, Davao Province, Davao.
hamatus DEJ., Spec. Gen. 5 (1831) 633.
LUZON, Manila: Laguna Province, Los Baños. MINDANAO, Davao Province, Davao.
leucops WIED., Zool. Mag. II 1 (1823) 52 (= *aeruginosus* Chaud.).
LUZON, Manila.
luzonicus CHAUD., Bull. Mosc. 3 (1856) 261.
LUZON, Laguna Province, Los Baños.
semperi CHAUD., Ann. Mus. Civ. Gen. 8 (1876) 92.
Philippine Islands.

CLIVINA LATREILLE, Hist. Nat. Crust. et Ins. 3 (1802) 96.

castanea WESTW., Proc. Zool. Soc. (1837) 128 (= *clivinoides* Schm. Goeb., fig. only = *parryi* Putz. = *lata* Putz.).
LUZON, Laguna Province, Los Baños; Mount Maquiling.

vulgivaga BOH.,* Eug. Res. Zool. Col. (1861) 9 (=*humilis* Morow.).
LUZON, Laguna Province, Mount Maquiling. MINDANAO, Davao Province, Davao.

CAELOSTOMUS MACLEAY, Ann. jav. (1825) 23 (= *Stomonoxus* Motsch.).

picipes MACL.,* Ann. jav. (1825) 24 [= *rufipes* Boh. = *striaticollis* † Chaud. (not Dej.)].

COLPODES MACLEAY, Ann. jav. (1925) 17 (= *Dyscolus* Dej. = *Loxocrepis* Eschsch.).

abropoides CHAUD., Ann. Soc. Ent. France (1878) 361.
Philippine Islands.

andrewesi HELLER, Ent. Mitt. (1926) 92 [= *rufitarsis* † Heller (not Chaud.)].
MINDANAO, Agusan Province, Butuan.

buchanani HOPE, Zool. Misc. (1831) 21 (= *amoenus* Chaud. = *splendens* Morow.).
LUZON, Benguet Subprovince, Baguio.

laetus ERICHS., Nov. Act. Leop. Carol. (1835) Suppl. 222, t. 37, f. 2 (=*apicalus* Chaud.) LUZON.

luzonicus CHAUD., Ann. Soc. Ent. France (1878) 366.
LUZON, Laguna Province, Mount Maquiling; Mount Banahao.

obscuritarsis CHAUD., Ann. Soc. Ent. France (1878) 375.
MINDANAO, Agusan Province, Butuan.

ruficeps MACL., Ann. jav. (1825) 25 [= *dohrni* Nietn. = *cyanipennis* † Chaud. (not Schm. Goeb. = *schmidti* Chaud.)].
LUZON, Manila.

COPTODERA DEJEAN, Spec. Gen. 1 (1825) 273 (= *Belonognatha* Chaud.).

eluta ANDR., Trans. Ent. Soc. London (1923) 30 [= *interrupta* † Chaud. (not Schm. Goeb.) = *elegantula* † Bates (not Schm. Goeb.)].
LUZON, Tayabas Province, Malinao. MINDANAO, Lanao Province, Iligan: Surigao Province, Surigao. NEGROS, Oriental Negros Province, Cuernos Mountains. SIBUYAN. BASILAN.

flexuosa SCHM. GOEB., Faun. Col. Birm. (1846) 55.
LUZON, Mount Banahao.

tetrastigma CHAUD.,* Ann. Soc. Ent. Belg. 12 (1869) 163.
LUZON, Laguna Province, Mount Maquiling. MINDANAO, Lanao Province, Kolambugan: Davao Province, Davao: Surigao Province, Surigao.

CYCLOSOMUS LATREILLE, in Cuvier's Reg. Anim. ed. 2 4 (April, 1829) 394 (note).

philippinus HELLER, Philip. Journ. Sci. 23 (1923) 302, t. 1., f. 3.
LUZON, Laguna Province, Los Baños.

DESERA HOPE, Col. Man. 2 (1838) 105 (= *Dendrocellus* Schm. Goeb.).

geniculata KLUG, Jahrb. Ins. (1834) 52.
LUZON, Laguna Province, Los Baños. MINDANAO, Davao Province, Davao.

schultzei HELLER, Philip. Journ. Sci. 23 (1923) 303 and 304.
LUZON, Rizal Province, Montalban Gorge.

DICRANONCUS CHAUDOIR, Bull. Mosc. 2 (1850) 392.

amabilis CHAUD.,* Ann. Soc. Ent. France (1859) 350 (note) and 359 [= *ruficeps* † Brullé (not MacL.)].
LUZON, Laguna Province, Mount Maquiling. PALAWAN.

DICRASPEDA CHAUDOIR, Bull. Mosc. 4 (1862) 300 (= *Eudalia* Cast.).

brunnea CHAUD.,* Bull. Mosc. 4 (1862) 300 (= *nitida* Sloane).
MINDANAO, Surigao Province, Surigao.

DIORYCHE MACLEAY, Ann. jav. (1825) 21.

torta MACL.,* Ann. jav. (1825) 21 (var.) (= *amoena* Dej. = *laetula* Bates).
LUZON, Laguna Province, Mount Maquiling.

DIPLOCHEILA BRULLÉ, in Audonin et Brullé Hist. Nat. 4 (1834) 407 [= *Rembus* || Dej. (not Germ.) = *Eccoptogenius* Chaud. = *Symphyus* Nietn.)].

colossus BATES,* Ann. Mus. Civ. Gen. (1892) 326 [= *impressa* † Redt. (not F.)].
LUZON, Manila.

laevigata BATES,* Ann. Mus. Civ. Gen. (1892) 326 [= *polita* † MacL. (not F.) = *moesta* † Bates (not Chaud.)].
LUZON, Laguna Province, Mount Maquiling.

DISCHISSUS BATES, Trans. Ent. Soc. London (1873) 243.

notulatus F., Syst. Eleuth. 1 (1801) 201 (= *longicornis* Schaum = *sumatranus* Dohrn).
LUZON, Laguna Province, Mount Maquiling.

DOLICHOCTIS SCHMIDT-GOEBEL, Faun. Col. Birm. (1846) 62.

gilvipes DEJ., Spec. Gen. 5 (1831) 396.
LUZON, Laguna Province, Los Baños; Mount Maquiling. MINDANAO, Surigao Province, Surigao.

tetracolon CHAUD.,* Ann. Soc. Ent. Belg. 12 (1869) 248.
MINDANAO, Bukidnon Province, Tangkulan: Agusan Province, Butuan: Davao Province, Davao: Zamboanga Province, Zamboanga (var.); Dapitan: Surigao Province, Surigao (var.). BASILAN.

DRYPTA LATREILLE, Précis des caractères génériques des Insectes (1796) 75.

lineola MACL., Ann. jav. (1825) 27.
LUZON, Manila.

lineola var. philippinensis CHAUD., Bull. Mosc. 2 (1877) 262.
LUZON, Manila.

ENDYNOMENA CHAUDOIR, Ann. Soc. Ent. Belg. 15 (1872) 86 (= *Saronychium* Blackb.).

pradieri FAIRM.,* Rev. et Mag. Zool. (1849) 34 (= *inconspicua* Blackb.).
Philippine Islands.

EUPLYNES Schmidt-Goebel, Faun. Col. Birm. (1846) 52.

cyanipennis Schm. Goeb.,* Faun. Col. Birm. (1846) 52.
Mindanao, Surigao Province, Surigao.

EUSCHIZOMERUS Chaudoir, Bull. Mosc. 2 (1850) 413.

rufipes Heller, Philip. Journ. Sci. 19 (1921) 526.
Luzon, Laguna Province, Mount Maquiling.

rufipes var. pilosulus Heller, Philip. Journ. Sci. 23 (1923) 301.
Panay, Capiz Province, Culasi.

GNATHAPHANUS MacLeay, Ann. jav. (1825) 20 (= *Pachauchenius* W. MacL.).

impressipennis Cast.,* Trans. Roy. Vict. Soc. 8 (1868) 186.
Mindanao, Davao Province, Davao.

philippensis Chevr., Rev. Zool. (1841) 221 (= *laeviceps* W. MacL.).
Luzon, Manila.

punctilabris MacL., Ann. jav. (1825) 20 (= *javanus* Dej. = *dispellens* Walk. = *gnathaphanoides* Bates).
Luzon, Manila; Laguna Province, Mount Maquiling.

vulneripennis MacL., Ann. jav. (1825) 20 (= *subcostatus* Dej. = *melanarius* Boh.).
Luzon, Manila.

HOLOLEIUS Laferté, Ann. Soc. Ent. France (1851) 214 and 274.

nitidulus Dej.,* Spec. Gen. 2 (1826) 341 (= *ceylanicus* Nietn. = *punctulatus* Chaud. = ? *ornatus* Tryon).

LESTICUS Dejean, Spec. Gen. 3 (1828) 189.

busuangae Heller, Philip. Journ. Sci. 23 (1923) 299 and 300.
Busuanga.

cupreatus Heller, Philip. Journ. Sci. 23 (1923) 299 and 300.
Luzon, Laguna Province, Los Baños; Mount Maquiling.

gregori Kuntz., Ent. Rundsch. (1911) 175 (= *mac-gregori* Heller).
Luzon, Benguet Subprovince, Irisan.

[*insignis* Gestro, Ann. Mus. Civ. Gen. (1882) 310.]

insignis var. philippinicus Kuntz., Ent. Rundsch. (1911) 175.
Cebu, Toledo.

prasinus Tchitch., Hor. Soc. Ent. Ross. 34 (1900) 178 and 193.

LIOPTERA Chaudoir, Ann. Soc. Ent. Belg. 12 (1869) 208.

quadriguttata Chaud., Ann. Soc. Ent. Belg. 12 (1869) 208.
Luzon, Laguna Province, Mount Maquiling.

LYMNASTIS Motschulsky, Etudes Ent. (1862) 27 (= *Zuphiolum* Fairm.).

pilosus Bates,* Ann. Mus. Civ. Gen. (1892) 296 (= *setiger* Sloane).

MACROCHEILUS Hope, Col. Man. 2 (1838) 166 (= *Acanthogenius* Reiche).

chaudoiri Andr., Trans. Ent. Soc. London (1919) 130 [= *trimaculatus* || Chaud. (not Oliv.) = *ruficollis* Heller)].
Luzon, Laguna Province, Los Baños.

trimaculatus OLIV., Enc. Méth. Ins. 2 (1790) 347, t. 179, f. 11 [= *bensoni* Hope = *quadrimaculatus* Guér. = *tripustulatus* † Guér. (not Dej.) = *tripustulatus* † Redt. (not F.)].
LUZON, Laguna Province, Los Baños; Mount Maquiling.

MICROLESTES SCHMIDT-GOEBEL, Faun. Col. Birm. (1846) 41 (= *Blechrus* Motsch.).

glabratus † REDT. (not Dufts.), Reise Novara Zool. 2 (1867) Col. 7 (note 1).
LUZON, Manila.

MISCELUS KLUG, Jahrb. Ins. (1834) 82 (= *Leptodactyla* Brullé).

javanus KLUG, Jahrb. Ins. (1834) 82, t. 1, f. 9 (= *apicalis* Brullé = *paradoxus* Putz. = *convexicollis* Putz. = *vulneratus* Putz. = *planatus* Schauf.).
LUZON, Laguna Province, Mount Maquiling. MINDANAO, Bukidnon Subprovince, Tangkulan.

javanus var. unicolor PUTZ.,* Mém. Soc. Liège 2 (1845) 375 (= *rufiventris* Walk. = *ceylonicus* Chaud. = *stygicus* Putz. = *morioformis* W. MacL. = *celebensis* Schauf.).
LUZON, Laguna Province, Los Baños; Mount Maquiling; Mount Banahao. SIBUYAN.

MOCHTHERUS SCHMIDT-GOEBEL, Faun. Col. Birm. (1846) 76 (= *Cyrtopterus* Motsch.).

tetraspilotus MACL., Ann. jav. (1825) 25 (= *tetrasemus* Dej. = *angulatus* Schm. Goeb. = *retractus* Walk. = *quadrinotatus* Motsch.).
LUZON, Laguna Province, Mount Maquiling: Tayabas Province, Malinao. MINDANAO, Zamboanga Province, Zamboanga.

MORIO LATREILLE, Consid. Gén. (1810) Tab. Méth. 159.

angustus CHAUD., Bull. Mosc. 2 (1880) 346.
Philippine Islands.

cucujoides WALK., Ann. Mag. Nat. Hist. III 2 (1858) 203 [= *trogositoides* || Walk. (not Chaud.) = *cordicollis* Chaud.].
LUZON, Laguna Province, Mount Maquiling. MINDANAO, Surigao Province, Surigao.

luzonicus CHAUD., Bull. Mosc. 1 (1852) 81 (= *intermedius* Chaud.).
LUZON, Manila: Laguna Province, Los Baños; Mount Maquiling.

orientalis DEJ.,* Spec. Gen. 1 (1825) 432 [= *walkeri* Putz. = *subconvexus* Chaud. = *submarginatus* Chaud. = *cucujoides* † Chaud. (not Walk.)].
Philippine Islands.

ODACANTHA PAYKULL, Faun. Suec. 1 (1798) 169 (= *Casnonia* Latr. and Dej. = *Arame* Andr.).

bimaculata REDT.,* in Hügel's Kaschmir IV 2 (1844) 498, t. 23, f. 2.
Philippine Islands.

OODES DEJEAN, Spec. Gen. 2 (1826) 374.

piceus NIETN.,* Journ. As. Soc. Bengal 6 (1856) 526 (= *vilus* Chaud.).
LUZON, Laguna Province, Los Baños; Mount Maquiling.

virens WIED., Zool. Mag. II 1 (1823) 50 (= *varians* Chaud.).
LUZON.

OPHIONEA KLUG, Ent. Braz. Spec. (1821) 298 (= *Casnoidea* Cast.).

bakeri DUPUIS, Ann. Soc. Ent. Belg. (1913) 270 [= *bhamoensis* † Maindr. (not Bates)].
LUZON, Laguna Province, Los Baños; Mount Maquiling.

ORTHOGONIUS MACLEAY, Ann. jav. (1825) 26 (= *Apsectra* Schm. Goeb. = *Haplopisthius* Chaud. = *Maraga* Walk.).

alternans WIED., Zool. Mag. II 1 (1823) 52 [= *duplicatus* † Bates (not Wied.) (part)].
LUZON, Manila.

hypocrita CHAUD., Ann. Soc. Ent. Belg. 14 (1871) 102.
LUZON, Laguna Province, Los Baños.

luzonicus CHAUD., Ann. Soc. Ent. Belg. 14 (1871) 123.
MINDANAO, Lanao Province, Kolambugan: Surigao Province, Surigao. SAMAR.

PACHYTRACHELUS CHAUDOIR, Bull. Mosc. 1 (1852) 85 (= *Batoscelis* Schm. Goeb., fig. only = ? *Systenognathus* Putz.).

oblongus DEJ., Spec. Gen. 5 (1831) 813 [= *angulatus* F. 1801 (not F. 1781) = *politus* Schm. Goeb., fig. only = *ceylonicus* Motsch.].
LUZON, Manila; Laguna Province, Los Baños; Mount Maquiling.

PENTAGONICA SCHMIDT-GOEBEL, Faun. Col. Birm. (1846) 47 [= *Rhombodera* || Reiche (not Burm.) = *Didetus* Lec. = *Elliotia* Nietn. = *Trichothorax* Montr. = *Xenothorax* Woll. = *Wakefieldia* Brown].

pallipes NIETN.,* Journ. As. Soc. Beng. 6 (1856) 525.
LUZON, Laguna Province, Mount Maquiling.

ruficollis SCHM. GOEB.,* Faun. Col. Birm. (1846) 48 (= *dichroa* Sloane).
SAMAR.

varicornis HELLER, Deutsch. Ent. Zeitschr. (1916) 269.
LUZON, Laguna Province, Mount Maquiling.

PERICALUS MACLEAY, Ann. jav. (1825) 15 (=*Coeloprosopus* Chaud.).

cicindeloides MACL.,* Ann. jav. (1825) 16, t. 1, f. 2.
PALAWAN.

levifrons HELLER, Deutsch. Ent. Zeitschr. (1916) 273.
MINDANAO, Agusan Province, Butuan: Surigao Province, Surigao.

philippinus HELLER, Deutsch. Ent. Zeitschr. (1916) 274, t. 3, f. 1.
LUZON, Mount Banahao.

quadrimaculatus MACL.,* Ann. jav. (1825) 15 (= *quadrisignatus* Cast.).
PALAWAN.
undatus CHAUD. Bull. Mosc. 1 (1848) 111.
LUZON, Laguna Province, Mount Maquiling: Benguet Subprovince, Baguio.

PERIGONA CASTELNAU, Etudes Ent. (1835) 151 (= *Nestra* Motsch. = *Trechicus* Lec. = *Spathinus* Nietn. = *Pentoplogenius* Morow. = *Siltopia* Cast. = *Extromus* Péring.).

livens PUTZ.,* Ann. Mus. Civ. Gen. (1873) 25.
LUZON, Laguna Province, Mount Maquiling. MINDANAO, Lanao Province, Iligan.
luzonica PUTZ., Ann. Mus. Civ. Gen. (1875) 728.
LUZON, Manila.
nigriceps DEJ.,* Spec. Gen. 5 (1831) 44 (= *umbripennis* Lec. = *fimicola* Woll. = *jansoniana* Woll. = *atriceps* Fairm. = *japonica* Bates = *beccarii* Putz. = *discalis* Chaud. = *suffusa* Bates = *pusilla* Péring. = *australica* Sloane).
LUZON, Laguna Province, Mount Maquiling.
plagiata PUTZ.,*Ann. Mus. Civ. Gen. (1875) 734 (= *nana* Bates).
LUZON, Mount Banahao. MINDANAO, Lanao Province, Kolambugan: Surigao Province, Surigao. PALAWAN, Puerto Princesa.

PERILEPTUS SCHAUM, Nat. Ins. Deutschl. 1 (1860) 663 (= *Blemus* † Dej. (not Steph.) = *Ochthephilus* ‖ Nietn. (not Muls.) = *Pyrrhotachys* Sloane.

melas JEANN., Mon. des Trechinæ (i) Ab. XXXII (1926) 416.
LUZON, Laguna Province, Mount Maquiling. MINDANAO.

PERONOMERUS SCHAUM, Ann. Soc. Ent. France (1853) 440.

fumatus SCHAUM, Ann. Soc. Ent. France (1853) 440 [= *nigrinus* † Heller (not Bates)].
LUZON, Laguna Province, Mount Maquiling.

PHEROPSOPHUS SOLIER, Ann. Soc. Ent. France (1833) 461.

emarginatus CHAUD., Ann. Soc. Ent. Belg. (1876) 20.
Philippine Islands.
fumigatus DEJ., Spec. Gen. 1 (1825) 307.
MINDANAO.
gironieri EYD. and SOUL., Rev. Zool. (1839) 264.
LUZON. MINDANAO.
javanus DEJ.,* Spec. Gen. 1 (1825) 305 [= *interruptus* † Schm. Goeb. (not Dej.) = *fimbriatus* Chaud. = *agnatus* Chaud.].
LUZON, Laguna Province, Los Baños.

PHLOEODROMIUS W. MACLEAY, Trans. Ent. Soc. N. S. Wales 2 (1871) 85 (= *Crossoglossa* Chaud.).

fasciatus CHAUD.,* Ann. Soc. Ent. Belg. 15 (1872) 179.
PALAWAN.

hastatus HELLER, Philip. Journ. Sci. 19 (1921) 528, t. 1, f. 2.
MINDANAO, Davao Province, Davao.
sellatus HELLER, Philip. Journ. Sci. 19 (1921) 526, t. 1, f. 1.
MINDANAO, Davao Province, Davao.

PHYSODERA ESCHSCHOLTZ, Zool. Atl. 2 (1829) 8.

dejeani ESCHSCH., Zool. Atl. 2 (1829) 8, t. 8, f. 6.
MINDANAO, Lanao Province, Iligan.
eburata HELLER, Philip. Journ. Sci. 23 (1923) 304 and 305, t. 1, f. 4.
LUZON, Laguna Province, Los Baños.
eschscholtzi PARRY, Trans. Ent. Soc. London (1849) 179, t. 18, f. 2 (= *davidis* Fairm.).
Philippine Islands.

PLATYMETOPUS DEJEAN, Spec. Gen. 4 (1829) 68.

[*flavilabris* F., Suppl. Ent. Syst. (1798) 59.]
flavilabris var. thunbergi QUENS., in Schönh. Syn. I 1 (1806) 188 (note) (= *punctulatus* MacL. = *obscuripes* Schauf.).
LUZON, Manila: Laguna Province, Mount Maquiling.
laticeps DEJ., Spec. Gen. 4 (1829) 76.
LUZON, Manila. MINDANAO, Zamboanga Province, Dapitan.

POGONOGLOSSUS CHAUDOIR, Bull. Mosc. 4 (1862) 304 (= *Libresthis* Schm. Goeb., fig. only = *Carpaulum* Sloane).

tagalus HELLER, Deutsch. Ent. Zeitschr. (1916) 271, t. 3, f. 2.
LUZON, Laguna Province, Mount Maquiling.

SCARITES FABRICIUS, Syst. Ent. (1775) 249.

longiusculus CHAUD., Ann. Soc. Ent. Belg. (1880) 86.
MINDORO, Mansalay.
semirugosus CHAUD., Bull. Mosc. 1 (1855) 90 (= *rugipennis* Chaud.).
LUZON, Manila.

STENOLOPHUS LATREILLE, in Cuvier's Règ. Anim. ed. 2 4 (April, 1829) 391 (= *Egadroma* Motsch.).

smaragdulus F.,* Suppl. Ent. Syst. (1798) 60 (= *trechoides* Hope = *stolidus* Walk. = *transmutans* Bates = *cyanellus* Bates).
MINDANAO, Davao Province, Davao.
smaragdulus var. quinquepustulatus WIED.,* Zool. Mag. II 1 (1823) 58.
LUZON, Laguna Province, Los Baños; Mount Maquiling. MINDANAO, Zamboanga Province, Dapitan.

STENOTELUS BOUCHARD, Ann. Soc. Ent. France (1903) 174.

opacus BOUCH.,* Ann. Soc. Ent. France (1903) 175.
MINDANAO, Davao Province, Davao.

? **SYSTOLOCRANIUS** CHAUDOIR, Bull. Mosc. 3 (1857) 23.

sulcatus ESCHSCH., Zool. Atl. 5 (1833) 28 (? = *linea* Wied. = *grandis* Dej.).

TACHYS STEPHENS, Ill. Brit. Ent. 2 (1828) 2 and 4.

barringtoni ANDR., Ann. Mus. Civ. Gen. (1925) 423.
LUZON, Laguna Province, Mount Maquiling: Rizal Province, Montalban. PALAWAN, Puerto Princesa.

ceylanicus NIETN., Ann. Mag. Nat. Hist. III 2 (1858) 423 (= *flaviculus* Motsch. = *anceps* Putz. = *infans* Bates).
LUZON, Manila: Rizal Province, Montalban: Laguna Province, Mount Maquiling; Pagsanjan: Bataan Province, Lamao: Mountain Province, Tinglayan. MINDANAO. SAMAR, Catbalogan. MINDORO, San Teodoro.

coracinus PUTZ.,* Ann. Mus. Civ. Gen. (1875) 739 (= *remotiporis* Bates).
LUZON, Laguna Province, Mount Maquiling.

fumigatus MOTSCH.,* Bull. Mosc. 4 (1851) 509 (= *emarginatus* Nietn.).
LUZON, Manila: Laguna Province, Los Baños; Mount Maquiling; Pagsanjan: Rizal Province, Montalban: Bataan Province, Lamao. MINDANAO, Surigao Province, Surigao.

haliploides BATES, Ann. Mus. Civ. Gen. (1892) 289 (? = *latissimus* Motsch.).
LUZON, Laguna Province, Los Baños (var.); Mount Maquiling.

imperfectus ANDR., Ann. Mus. Civ. Gen. (1925) 413.
LUZON, Rizal Province, Montalban.

impressipennis MOTSCH.,* Etudes Ent. (1859) 39 (= *dohertyi* Jord. = *sinuaticollis* Sloane).
LUZON, Manila.

klugi NIETN.,* Ann. Mag. Nat. Hist. III 2 (1858) 423 (= *sulculatus* Putz. = *euglyptus* Bates = *feanus* Bates).
PALAWAN, Puerto Princesa.

klugi var. sulcatopunctatus PUTZ., Ann. Mus. Civ. Gen. (1875) 742.
LUZON, Manila: Laguna Province, Los Baños; Mount Maquiling: Rizal Province, Montalban. MINDANAO, Agusan Province, Butuan.

ornatus APETZ, Col. Brehm (1854) 12 (= *orientalis* Nietn.).
LUZON, Mountain Province, Tinglayan.

ovatus MOTSCH.,* Bull. Mosc. 4 (1851) 509 (= *albicornis* Schaum = *mirabilis* Bates = *mirandus* Dupuis).
LUZON, Laguna Province, Mount Maquiling.

plagiatus PUTZ., Ann. Mus. Civ. Gen. (1875) 745 (= *doddi* Sloane).
Philippine Islands.

plagiatus var. longulus ANDR., Ann. Mus. Civ. Gen. (1925) 371.
LUZON, Manila.

pulcher ANDR., Ann. Mus. Civ. Gen. (1925) 428.
MINDANAO, Zamboanga Province, Zamboanga.

punctus ANDR., Ann. Mus. Civ. Gen. (1925) 473.
LUZON, Laguna Province, Mount Maquiling.

punctus var. variabilis ANDR., Ann. Mus. Civ. Gen. (1925) 474.
MINDORO, Mindoro Province, Calapan.

[*quadrillum* SCHAUM, Berl. Ent. Zeitschr. (1860) 201 (= *pictipennis* Putz. = *spilotus* Bates).

quadrillum var. impictus ANDR., Ann. Mus. Civ. Gen. (1925) 373.
LUZON, Manila.

serratus ANDR., Ann. Mus. Civ. Gen. (1925) 344.
LUZON, Laguna Province, Los Baños.

triangularis NIETN.,* Ann. Mag. Nat. Hist. III 2 (1858) 422 (= *atriceps* W. MacL. = *trechiformis* Jord.).
LUZON, Manila: Laguna Province, Los Baños; Mount Maquiling; Pagsanjan: Rizal Province, Montalban. MINDANAO, Davao Province, Davao.

truncatus NIETN.,* Ann. Mag. Nat. Hist. III 2 (1858) 421.
MINDORO, Calapan; San Teodoro.

umbrosus MOTSCH.,* Bull. Mosc. 4 (1851) 507 (= *parallelus* Motsch. = *extremus* Walk. = *nietneri* Schaum).
LUZON, Laguna Province, Mount Maquiling: Nueva Vizcaya Province, Imugan. MINDANAO, Surigao Province, Surigao.

THLIBOPS PUTZEYS, Ann. Soc. Ent. Belg. 10 (1867) 9.

abbreviatus HELLER, Philip. Journ. Sci. 23 (1923) 297 and 298.
LUZON, Rizal Province, Montalban.

glabriventris HELLER, Deutsch. Ent. Zeitschr. (1916) 276.
LUZON, Mount Banahao.

integricollis HELLER, Philip. Journ. Sci. 23 (1923) 296 and 298.
LUZON, Benguet Subprovince, Baguio: Zambales Province, Iba.

intermedius HELLER, Philip. Journ. Sci. 19 (1921) 530.
LUZON, Laguna Province, Los Baños; Mount Maquiling.

minor HELLER, Deutsch. Ent. Zeitschr. (1916) 275.
LUZON, Mount Banahao.

omega HELLER, Abh. Mus. Dresd. VII 8 (1899) 3.
LUZON. SIBUYAN.

TRECHODES BLACKBURN, Trans. Roy. Soc. S. Austr. 25 (1901) 119.

bakeri JEANN., Mon. des Trechinæ (i) XXXII (1926) 491, f. 266.
LUZON, Laguna Province, Mount Maquiling.

TRECHUS SCHELLENBERG, Helv. Ent. 2 (1806) 22 (= *Blemus* Steph.).

bakeri JEANN., Ann. Mag. Nat. Hist. IX 12 (1923) 416 and 426, f. 16.
LUZON, Benguet Subprovince, Baguio.

TRIGONOTOMA DEJEAN, Spec. Gen. 3 (1828) 182.

leotaudi TCHITCH., Hor. Soc. Ent. Ross. 34 (1900) 158 and 185.
LUZON, Manila.

luzonica CHAUD., Ann. Soc. Ent. Belg. 11 (1868) 161.
LUZON, Manila: Laguna Province, Mount Maquiling.

palawanica TCHITCH., Hor. Soc. Ent. Ross. 30 (1897) 263.
PALAWAN.

ALPHABETICAL LIST OF SYNONYMOUS AND SUBORDINATE GENERIC NAMES OCCURRING IN THIS CATALOGUE

Acanthogenius, *see* Macrocheilus.
Agonothorax, *see* Anchomenus.
Agonum, *see* Anchomenus.
Apsectra, *see* Orthogonius.
Arame, *see* Odacantha.
Batoscelus, *see* Pachytrachelus.
Belonognatha, *see* Coptodera.
Blechrus, *see* Microlester.
Blemus, *see* Perileptus; *see also* Trechus.
Carpaulum, *see* Pogonoglossus.
Casnoidea, *see* Ophionea.
Casnonia, *see* Odacantha.
Coeloprosopus, *see* Pericalus.
Crossoglossa, *see* Phloeodromius.
Cyrtopterus, *see* Mochtherus.
Dendrocellus, *see* Desera.
Didetus, *see* Pentagonica.
Dyscolus, *see* Colpodes.
Eccoptogenius, *see* Diplocheila.
Egadroma, *see* Stenolophus.
Elliotia, *see* Pentagonica.
Eudalia, *see* Dicraspeda.
Extromus, *see* Perigona.
Haplopisthius, *see* Orthogonius.
Hispalis, *see* Amblystomus.
Hoplomenes, *see* Aristolebia.
Leptodactyla, *see* Miscelus.
Libresthis, *see* Pogonoglossus.
Loxocrepis, *see* Colpodes.
Maraga, *see* Orthogonius.
Megaristerus, *see* Amblystomus.
Nestra, *see* Perigona.
Ochthephilus, *see* Perileptus.
Pachauchenius, *see* Gnathaphanus.
Paraphaea, *see* Anchista.
Pentoplogenius, *see* Perigona.
Platynus, *see* Anchomenus.
Pyrrhotachys, *see* Perileptus.
Rembus, *see* Diplocheila.
Rhombodera, *see* Pentagonica.
Saronychium, *see* Endynomena.
Siltopia, *see* Perigona.
Spathinus, *see* Perigona.
Stomonoxus, *see* Caelostomus.
Symphyus, *see* Diplocheila.
Systenognathus, *see* Pachytrachelus.
Thenarotidius, *see* Amblystomus.
Trechicus, *see* Perigona.
Trichothorax, *see* Pentagonica.
Wakefieldia, *see* Pentagonica.
Xenothorax, *see* Pentagonica.
Zuphiolum, *see* Lymnastis.

ALPHABETICAL LIST OF SPECIFIC NAMES

[Synonyms are printed in italics.]

abbreviatus (Thlibops).
abropoides (Colpodes).
adelioides (Aephnidius).
aequatus (Catascopus).
aeruginosus (*Chlaenius*).
agnatus (*Pheropsophus*).
albicornis (*Tachys*).
alternans (Orthogonius).
amabilis (Dicranoncus).
amoena (*Dioryche*).
amoenus (*Colpodes*).
anceps (*Tachys*).
andrewesi (Colpodes).
angulatus (*Mochtherus*).
angulatus (*Pachytrachelus*).
angustus (Morio).
annamensis (Acupalpus).
apicalis (*Colpodes*).
apicalis (*Miscelus*).
atriceps (*Perigona*).
atriceps (*Tachys*).
australica (*Perigona*).
australis (*Aephnidius*).
bakeri (Bembidion).
bakeri (Ophionea).
bakeri (Trechodes).
bakeri (Trechus).
barringtoni (Tachys).
basalis (Anaulacus).
batesi (*Bembidion*).
beccarii (*Perigona*).
bensoni (*Macrocheilus*).
bhamoensis (*Ophionea*).
biguttatus (*Chlaenius*).

bimaculata (Odacantha).
bimaculatus (Chlaenius).
binotata (Anchista).
binotatus (*Chlaenius*).
brunnea (Dicraspeda).
buchanani (Colpodes).
busuangae (Lesticus).
castanea (Clivina).
celebensis (*Miscelus*).
ceylanicus (*Hololeius*).
ceylanicus (Tachys).
ceylonicus (*Miscelus*).
ceylonicus (*Pachytrachelus*).
chaudoiri (Macrocheilus).
cicindeloides (Pericalus).
clivinoides (*Clivina*).
colossus (Diplocheila).
convexicollis (*Miscelus*).
coracinus (Tachys).
cordicollis (*Morio*).
corpulentus (*Brachidius*).
crassicornis (Brachidius).
cucujoides (Morio).
cuprascens (Apristus).
cupreatus (Lesticus).
cuspidatus (Chlaenius).
cyanellus (*Stenolophus*).
cyanipennis (Allocota).
cyanipennis (*Colpodes*).
cyanipennis (Euplynes).
davaonis (Aristolebia).
davidis (*Physodera*).
dejeani (Physodera).
dichroa (*Pentagonica*).
discalis (*Perigona*).
discoidalis (Calleida).
discophora (*Anchista*).
dispellens (*Gnathaphanus*).
doddi (*Tachys*).
dohertyi (*Tachys*).
dohrni (*Colpodes*).
duplicatus (*Orthogonius*).
eburata (Physodera).
elegans (Catascopus).
elegantula (*Coptodera*).
eluta (Coptodera).
emarginatus (Pheropsophus).
emarginatus (*Tachys*).
eschscholtzi (Physodera).
euglyptus (*Tachys*).
extremus (*Tachys*).
facialis (Catascopus).
fasciatus (Anaulacus).
fasciatus (Phloeodromius).
feanus (*Tachys*).
fimbriatus (*Pheropsophus*).
fimicola (*Perigona*).
flaviculus (*Tachys*).
flaviguttatus (Chlaenius).
flavilabris (Platymetopus).
flexuosa (Coptodera).
fumatus (Peronomerus).
fumigatus (Pheropsophus).
fumigatus (Tachys).
fuscus (Apotomus).
geniculata (Desera).
gilvipes (Dolichocitis).
gironieri (Pheropsophus).
glabratus (Microlestes).
glabriventris (Thlibops).
gnathaphanoides (*Gnathaphanus*).
grandis (*Systolocranius*).
gregori (Lesticus).
guttatus (Amblystomus).
guttatus (Chlaenius).
guttula (Chlaenius).
haliploides (Tachys).
hamatum (*Bembidion*).
hamatus (Chlaenius).
hastatus (Phloeodromius).
humilis (*Clivina*).
hypocrita (Orthogonius).
imperfectus (Tachys).
impictus (Tachys).
impressa (*Diplocheila*).
impressipennis (Gnathaphanus).
impressipennis (Tachys).
inconspicua (*Endynomena*).
infans (*Tachys*).
insignis (Lesticus).
integricollis (Thlibops).
interrupta (*Coptodera*).
interruptus (*Pheropsophus*).
intermedius (*Morio*).
intermedius (Thlibops).
jansoniana (*Perigona*).
japonica (*Perigona*).
javanus (*Gnathaphanus*).
javanus (Miscelus).
javanus (Pheropsophus).

klugi (Tachys).
laetula (*Dioryche*).
laetus (Colpodes).
laeviceps (*Gnathaphanus*).
laevigata (Diplocheila).
lata (*Clivina*).
laticeps (Platymetopus).
latissimus (Tachys).
leotaudi (Trigonotoma).
leucops (Chlaenius).
levifrons (Pericalus).
linea (Systolocranius).
lineola (Drypta).
livens (Perigona).
longicornis (*Dischissus*).
longiusculus (Scarites).
longulus (Tachys)
luzonica (Perigona).
luzonica (Trigonotoma).
luzonicus (Brachinus).
luzonicus (Chlaenius).
luzonicus (Colpodes).
luzonicus (Morio).
luzonicus (Orthogonius).
mac-gregori (*Lesticus*).
maculifer (*Chlaenius*).
melanarius (*Gnathaphanus*).
melas (Perileptus).
microgonus (Anoplogenius).
minor (Thlibops).
mirabilis (*Tachys*).
mirandus (*Tachys*).
moesta (*Diplocheila*).
morioformis (*Miscelus*).
nana (*Perigona*).
nietneri (*Tachys*).
nigriceps (Perigona).
nigrinus (*Peronomerus*).
nigrosericans (*Anchomenus*).
niloticum (Bembidium).
nitida (*Dicraspeda*).
nitidulus (Hololeius).
notulatus (Dischissus).
oblongus (Pachytrachelus).
obscuripes (*Platymetopus*).
obscuritarsis (Colpodes).
omega (Thlibops).
opacus (Stenotelus).
orientalis (Morio).
orientalis (*Tachys*).
ornatus (*Hololeius*).
ornatus (Tachys).
ovatus (Tachys).
palawanica (Trigonotoma).
paradoxus (*Miscelus*).
parallelus (Celaenephes).
parallelus (*Tachys*).
pallipes (Pentagonica).
parryi (*Clivina*).
philippensis (Gnathaphanus).
philippinensis (Anaulacus).
philippinensis (Drypta).
philippinicus (Lesticus).
philippinus (Cyclosomus).
philippinus (Pericalus).
piceus (Brachinus).
piceus (Oodes).
picipes (Caelostomus).
pictipennis (*Tachys*).
pilosulus (Euschizomerus).
pilosus (Lymnastis).
plagiata (Perigona).
plagiatus (Tachys).
planatus (*Miscelus*).
polita (*Diplocheila*).
politus (*Pachytrachelus*).
pradieri (Endynomena).
prasinus (Lesticus).
pulcher (Tachys).
punctatus (*Chlaenius*).
puncticeps (*Chlaenius*).
punctilabris (Gnathaphanus).
punctulatus (*Hololeius*).
punctulatus (*Platymetopus*).
punctus (Tachys).
pusilla (*Perigona*).
quadriguttata (Lioptera).
quadriguttatus (Amblystomus).
quadrillum (Tachys).
quadrimaculatus (*Macrocheilus*).
quadrimaculatus (Pericalus).
quadrinotatus (*Mochtherus*).
quadripunctatus (Anchomenus).
quadrisignatus (*Pericalus*).
quinquepustulatus (Stenolophus).
remotiporis (*Tachys*).
retractus (*Mochtherus*).
rubricata (Calleida).
ruficeps (Colpodes).
ruficeps (*Dicranoncus*).
ruficollis (*Macrocheilus*).
ruficollis (Pentagonica).

rufipes (*Caelostomus*).
rufipes (Euschizomerus).
rufitarsis (*Colpodes*).
rufiventris (*Miscelus*).
rugipennis (*Scarites*).
rugulosa (Brachyctis).
schmidti (*Colpodes*).
schultzei (Desera).
sellatus (Phloeodromius).
semirugosus (Scarites).
semperi (Chlaenius).
sericeus (*Aephnidius*).
sericipennis (*Anaulacus*).
serratus (Tachys).
setiger (*Lymnastis*).
signifera (*Anchista*).
simplex (Aephnidius).
simplex (Catascopus).
sinuaticollis (*Tachys*).
smaragdulus (Catascopus).
smaragdulus (Stenolophus).
spilotus (*Tachys*).
splendens (*Colpodes*).
splendidula (Calleida).
stolidus (*Stenolophus*).
striaticollis (*Caelostomus*).
stygicus (*Miscelus*).
subconvexus (*Morio*).
subcostatus (*Gnathaphanus*).
submarginatus (*Morio*).
suffusa (*Perigona*).
sulcatopunctatus (Tachys).
sulcatus (? Systolocranius).
sulculatus (*Tachys*).
sumatranus (*Dischissus*).
sumbawanus (*Apotomus*).
tagalus (Pogonoglossus).
tetracolon (Dolichoctis).
tetrasemus (*Mochtherus*).
tetraspilotus (Mochtherus).
tetrastigma (Coptodera).
thunbergi (Platymetopus).
torta (Dioryche).
transmutans (*Stenolophus*).
trechiformis (*Tachys*).
trechoides (*Stenolophus*).
triangularis (Tachys).
trimaculatus (*Macrocheilus*).
tripustulatus (*Macrocheilus*).
trogositoides (*Morio*).
truncatus (Tachys).
umbripennis (*Perigona*).
umbrosus (Tachys).
undatus (Pericalus).
unicolor (Miscelus).
variabilis (Tachys).
varians (*Oodes*).
varicornis (Pentagonica).
vilus (*Oodes*).
virens (Oodes).
viridipennis (Allocota).
vulgivaga (Clivina).
vulneratus (*Miscelus*).
vulneripennis (Gnathaphanus).
walkeri (*Morio*).
xanthotelus (Apotomus).

NEW OR LITTLE-KNOWN TIPULIDÆ FROM EASTERN ASIA (DIPTERA), PART I

By CHARLES P. ALEXANDER

Of Amherst, Massachusetts [1]

TWO PLATES

In the present paper, undescribed species of crane flies from various parts of China and Japan are considered. The paper is based to a large extent upon a very interesting series from Che-kiang, China, where they were collected by Mr. E. Suenson, in the hills south of Ning-po, halfway to Nimrod Sound. The Japanese species include material from Hokkaido taken by Messrs. Satoru Kuwayama and Matsuji Hori; from Honshiu and Shikoku, kindly submitted by Messrs. K. Takeuchi and C. Harukawa; and a species from Taiwan included in large series of Tipulidæ sent to me by Doctor Shiraki. I wish to express my sincere thanks to all of the above-mentioned entomologists for their kindness in collecting these fragile flies. The types of the species are preserved in my collection through the interest of the various collectors.

LIMONIINÆ

Dicranomyia paramorio sp. nov.

Belongs to the *morio* group; antennæ black throughout; thoracic pleura heavily pruinose; male hypopygium with the dorsal dististyle an acutely pointed cylindrical rod; ventral dististyle with the rostrum bearing a single long pale spine.

Male.—Length, about 4 millimeters; wing, 5.8.

Female.—Length, about 6.2 millimeters; wing, 7.

Rostrum and palpi black. Antennæ black throughout, the flagellar segments oval. Head black, the anterior vertex silvery.

Thorax shiny black, the pleura with a conspicuous microscopic gray pubescence that appears like a bloom, especially on the sternopleurite and the cephalic portion of the pteropleurite. Halteres yellow, the knobs dark brown. Legs with the

[1] Contribution from the Department of Entomology, Massachusetts Agricultural College.

coxæ yellow, the fore coxæ with the basal half dark brown; trochanters obscure yellow; femora yellowish brown, the fore femora more uniformly darker, the posterior femora paler, with the tips relatively narrowly darker. Tibiæ and tarsi brownish black. Wings (Plate 1, fig. 1) with a faint brownish tinge, the stigma oval, darker brown than the ground color; veins dark brown. Venation: Sc_1 ending opposite the origin of Rs, Sc_2 very far from its tip, at about two-thirds the length of Sc; Rs long, in alignment with R_{2+3}; tip of R_1 very faint. In the female, Sc_1 ends just beyond the origin of Rs.

Abdominal tergites brown, the caudal margins of the basal segments broadly obscure yellow; outer segments more uniformly darkened, including the hypopygium; basal sternites extensively obscure yellow. In the female, the basal sternites are bicolorous, the tergites more uniformly black, only the caudal margins of the segments being dark brown instead of black. Male hypopygium (Plate 2, fig. 1) with the basistyles, *b*, relatively small, the ventromesal lobe setiferous. Dorsal dististyle, *dd*, slender, the extreme tip suddenly narrowed into an acute point. Ventral dististyle, *vd*, fleshy, larger than the basistyle; rostrum slender, provided with a single long pale flattened spine arising from a short squat base, the spine longer than the rostrum beyond it; basad of this spine is a small tubercle that is otherwise unarmed. Gonapophyses, *g*, narrow, dark brown. Ædeagus, *a*, broad, the base setiferous. The dorsal dististyles are like those of the ordinary type of the *morio* group, but the ventral dististyle is more like that of the aberrant *D. pseudomorio* Alexander (eastern Asia).

Habitat.—China (Che-kiang).

Holotype, male, hills south of Ning-po, May 1, 1925 (*E. Suenson*). Allotopotype, female.

Antocha (Antocha) confluenta sp. nov.

General coloration brownish gray, the ventral thoracic pleurites lighter gray; rostrum obscure yellow; antennæ dark brown throughout; wings with a dusky tinge; cell 1st M_2 open by the atrophy of m.

Male.—Length, 5 to 5.5 millimeters; wing, 6 to 6.5. Rostrum obscure yellow, the palpi dark brown. Antennæ dark brown throughout; flagellar segments oval with a conspicuous white pubescence. Head dark gray.

Mesonotum dark brownish gray without evident stripes; posterior sclerites of the mesonotum somewhat paler. Pleura dorsally grayish brown, the sternopleurite and pteropleurite light gray pruinose. Halteres brown, the base of the stem narrowly pale. Legs with the coxæ and trochanters yellow; femora brownish testaceous to darker brown, the segments outwardly passing into darker. Wings (Plate 1, fig. 2) with a faint dusky tinge; stigma barely indicated, pale brown; veins pale brown. Macrotrichiæ restricted to the apical half of vein R_{4+5} and the apical two-fifths of veins M_{1+2} and M_3. Anal angle very conspicuous. Venation: r lying opposite or just beyond the level of r-m; cell 1st M_2 open by the atrophy of m; m-cu about one-third its length before the fork of M.

Abdomen dark brown, including the hypopygium; sternites 1 to 4 with a median yellow stripe. Male hypopygium (Plate 2, fig. 2) with the caudal margin of the ninth tergite, *t*, unequally trilobed, the broader lateral lobes provided with larger setæ, the small, low median lobe with a lesser number of small setæ. Basistyles, *b*, relatively short and stout. Dististyles, *d*, fused basally, the outer style chitinized, gently curved to the subacute tip, the apical portion carinate; inner style subequal in length, fleshy, provided with numerous small setæ. Gonapophyses, *g*, small and slender, the two taken together appearing lyriform, each apophysis gently sinuous. Ædeagus, *a*, broad.

Habitat.—China (Che-kiang).

Holotype, male, hills south of Ning-po, May 1, 1925 (*Suenson*). Paratopotypes, 3 males.

The present fly shows features of resemblance to the genus *Orimargula* Mik and tends to break down the distinctions between the two genera. Despite this point of contact, I consider that the two genera are sufficiently differentiated. *Antocha* is essentially Holarctic in its distribution, with numerous species in eastern Asia and a lesser number elsewhere in the Nearctic and Palæarctic Regions. A few species occur farther south but then only at higher altitudes in the Himalayas and the mountains of the East Indian islands. *Orimargula*, on the contrary, is essentially Palæotropical in its distribution, with only the genotype, *alpigena* Mik, and the small fly described hereinafter as *O. flavella* sp. nov., occurring in the Holarctic Region. In the Tropics the genus shows a great distribution in the Ethiopian Region, and again in Australia, occurring as far south as Tas-

mania. It is probable that future collecting will add much to our knowledge of these two genera.

Orimargula flavella sp. nov.

General coloration obscure testaceous yellow; rostrum obscure yellow; antennæ indistinctly bicolorous; head light silvery gray; wings subhyaline, the veins pale.

Female.—Length, about 3.5 to 3.7 millimeters; wing, 4.5. Rostrum obscure yellow; basal segments of palpi obscure yellow, the terminal segments passing into brown. Antennæ with the scapal segments obscure yellow; flagellar segments indistinctly bicolorous, the bases of the individual segments pale, the apices more infuscated, the amount of darkening increasing on the outer segments. Head light silvery gray.

Thorax obscure testaceous yellow, the pteropleurite with a vague darkening. Halteres pale. Legs with the coxæ and trochanters yellow; remainder of the legs pale, only the terminal tarsal segments faintly darker. Wings subhyaline, the veins pale. Macrotrichiæ on the distal three-fourths of R_{4+5} and M_{1+2}; all of M_3 except the base, and about six well scattered along vein M_4. Venation: r–m shorter than the basal section of R_{4+5}; r proximad of r–m, on R_{2+3} at about its own length beyond the end of Rs; cell M_3 about twice its petiole; m–cu very oblique, about two-thirds to three-fourths its own length before the fork of M.

Abdomen obscure yellow, the lateral margins of the tergites slightly darker.

Habitat.—China (Che-kiang).

Holotype, female, hills south of Ning-po, May 1, 1925 (*Suenson*). Paratopotype, 1 female.

Orimargula flavella fuscolineata subsp. nov.

Female.—Length, about 4 millimeters; wing, 4.8. Generally similar to the typical form, differing as follows:

Antennæ somewhat longer, the flagellum uniformly dark brown. Mesonotal præscutum yellow with a very broad, conspicuous, dark brown, median stripe that ends just before the suture, the posterior end feebly bifid. Scutum broadly pale medially, the lobes infuscated; scutellum concolorous with the median area of the scutum; postnotal mediotergite pale, more darkened behind. Pleura yellowish testaceous, the anepisternum infuscated. Bases of veins R_{4+5} and M_{1+2} more extensively glabrous. Venation as shown in Plate 1, fig. 3.

Habitat.—China (Che-kiang).

Holotype, male, hills south of Ning-po, May 1, 1925 (*Suenson*).

Molophilus velvetus sp. nov.

General coloration light gray, the pleura dark brown; head yellow, the center of the vertex blue-gray; knobs of the halteres dark; legs dark brown; abdomen dark brown, the hypopygium paler; outer lateral angle of basistyle of male hypopygium prolonged into a slender setiferous lobe.

Male.—Length, about 4 millimeters; wing, 5.2. Rostrum and palpi brownish black. Antennæ short, the basal segments yellowish, the terminal segments passing into brown; flagellar segments oval. Head obscure yellow, the vertex extensively blue-gray, this color reaching the posterior lateral angles of the eyes but the occipital region remaining pale.

Pronotum pale dorsally. Lateral pretergites very pale yellowish white. Mesonotal præscutum with a blue-gray bloom, the narrow brown interspaces indicated behind; pseudosutural foveæ and tuberculate pits dark; lateral margins of the præscutum behind the foveæ narrowly yellowish; scutum dark, pruinose; scutellum dark, the caudal margin narrowly brownish yellow; postnotum dark brown. Pleura dark brown. Halteres brown, the knobs dark brown. Legs with the fore coxæ dark brown, the middle and posterior coxæ paler; trochanters brownish yellow; remainder of the legs dark brown. Wings yellowish, the costal region brighter yellow; anal angle narrowly darkened; veins yellowish, the macrotrichiæ pale brown. Venation: Proximal end of cell R_3 lying far basad of either cell R_4 or R_5, the two latter subequal in length; m-cu near midlength of M_{3+4}; vein 2d A elongate, sinuous, ending about opposite the caudal end of the slightly oblique m-cu.

Abdomen dark brown, the hypopygium brownish yellow. Male hypopygium (Plate 2, fig. 11) with the outer lateral angle of the basistyle, *b*, produced caudad into a slender lobe, setiferous except for the restricted acute apex which is chitinized; mesal lobe of basistyle very broad and flattened, the margin with abundant erect setæ. Dististyles two, lying in the notch of the basistyle; outer dististyle, *od*, flattened, the apex narrower, the distal third with an appressed velvety pubescence; inner margin of the style with a series of microscopic conical roughenings; inner, dististyle, *id*, broad at base, prolonged caudad into

a slender cylindrical rod, the surface with vague, microscopic appressed spinulæ.

Habitat.—China (Che-kiang).

Holotype, male, hills south of Ning-po, May 1, 1925 (*Suenson*).

Erioptera (Erioptera) harukawai sp. nov.

Male.—Length, about 4 to 4.2 millimeters; wing, 5.4 to 6. Generally similar to *E.* (*E.*) *elegantula* Alexander, differing chiefly in the wing pattern and the structure of the male hypopygium.

Flagellar segments shorter, more oval. Knobs of the halteres infuscated. Legs with the femoral bases broadly pale. Wings narrower, whitish subhyaline (Plate 1, fig. 4) with the brown pattern reduced to very tiny spots at the origin of Rs, Sc_2, r, tip of R_1, and as a vague seam along the cord, interrupted at the fork of M; veins brownish black. Venation: m-cu strongly sinuous; vein 2d A strongly sinuous, in some cases with a strong kink immediately beyond midlength. Male hypopygium with the acicular gonapophyses pale throughout. In *elegantula* they are heavily blackened apically.

Habitat.—Japan (Honshiu).

Holotype, male, Kurashiki, Okayama-ken, altitude 12 meters, April 6, 1925 (*C. Harukawa*). Paratopotypes, 6 males, April 2 to 16, 1925 (*Harukawa*); paratype, male, Gifu, Mino-no-kuni, May 3, 1921 (*K. Takeuchi*).

The species is named in honor of the collector, my friend Prof. C. Harukawa, entomologist of the Ohara Institute for Agricultural Research, to whom I am indebted for numerous Tipulidæ from Kurashiki and elsewhere in Japan.

Gonomyia (Ptilostena) kuwayamai sp. nov.

Female.—Length, about 5 millimeters; wing, 6 to 6.1. Closely related to *G.* (*P.*) *sachalinensis* Alexander (Karafuto), differing as follows:

Size smaller. Head grayish yellow, the center of the vertex darker. Mesonotal præscutum with the median brown stripe well indicated, the lateral stripes subobsolete; scutal lobes dark; scutellum reddish brown, somewhat testaceous; postnotal mediotergite dark medially, the sides paling to reddish brown. Pleura reddish without evident pale stripes as in *sachalinensis*. Halteres yellow, the knobs broken. Legs with the coxæ and trochanters reddish; femora yellow, passing into dark brown,

this color very extensive on the fore legs where it includes more than the distal two-thirds, narrower on the hind legs where less than the distal third is darkened; tibiæ light brown, the tips narrowly blackened; tarsi brownish black, the basitarsi paler at proximal ends. Wings (Plate 1, fig. 5) with a strong yellowish tinge, the costal region and the space between the branches of Cu lighter yellow; stigma small; veins dark brownish yellow. Venation: Sc_1 ending shortly before midlength of the relatively short, arcuated Rs, Sc_2 before the origin of Rs; R_{2+3} relatively short and straight, only a little longer than the petiole of cell 2d M_2; in *sachalinensis* (Plate 1, fig. 6) R_{2+3} is long and gently arcuated, nearly twice as long as the petiole of cell 2d M_2; veins R_1 and R_2 contiguous at wing-margin, closing cell R_1.

Abdomen with the caudal margins of the tergites very narrowly and indistinctly yellowish, much less evident than in *sachalinensis*.

Habitat.—Japan (Hokkaido).

Holotype, male, Maruyama, near Sapporo, Ishikari-no-kuni, July 24, 1925 (*S. Kuwayama*). Allotopotype, female; paratopotypes, 2 females.

This interesting fly is named in honor of Prof. Satoru Kuwayama, entomologist of the Hokkaido Agricultural Experiment Station, who has sent me many interesting Tipulidæ from Hokkaido and Karafuto. The most evident points in which the present species differs from *sachalinensis* are the coloration of the head and thorax, the darkened femora, the strongly flavescent wings, and the venation. The abdomen of the unique male type was lost before the hypopygium could be studied.

Cladura bidens sp. nov.

General coloration pale fulvous yellow; tips of the femora and tibiæ narrowly infuscated; abdomen bicolored, the caudal margins of the segments pale, the bases infuscated; male hypopygium only moderately incrassated, the basistyles stout; dististyle single, stout; each gonapophysis produced into two strong teeth at apex.

Male.—Length, about 6.5 millimeters; wing, 8.

Female.—Length, 7.5 milimeters; wing, 9.

Rostrum and palpi obscure yellow, the terminal segments of the latter a little infuscated. Antennæ relatively short, the basal segments yellow, the outer segments weakly bicolorous, the basal portions of the individual segments being a little darker than the tips. Head brownish yellow.

Pronotum yellow. Mesonotum shiny fulvous yellow, the median area of the præscutum a little darker, the lateral margins narrowly yellowish; scutellum and postnotum more infuscated. Pleura yellow. Halteres yellow, the knobs weakly infuscated. Legs with the coxæ and trochanters light yellow; femora and tibiæ brownish yellow, the tips narrowly but conspicuously dark brown; tarsi dark brown, the proximal ends of the basitarsi paler. Wings with a yellowish tinge, the stigmal region still more yellowish; veins dark. Macrotrichiæ relatively long and conspicuous. Venation: Sc_1 ending some distance beyond the origin of R_2, Sc_2 removed from its tip to a distance about equal to m-cu; Rs sinuous; r present, variable in position, usually at or before middistance between the fork of R_{2+3} and the tip of R_1; m a little shorter than the petiole of cell M_1; m-cu at or beyond the fork of M.

Abdominal tergites indistinctly bicolorous, dark brown, the caudal margins of the segments paler; on the sternites this bicolorous appearance is more clearly indicated. In the female the brown of the segments is largly confined to the cephalic and lateral portions, leaving the median area pale as a more or less distinct median stripe. Subterminal segment of male dark brown; hypopygium pale yellowish brown. Male hypopygium (Plate 2, fig. 6) of the general structure of *C. autumna* Alexander, there being a single stout dististyle and the basistyle of moderate length and stoutness. Dististyle, *d*, broadest at base. Gonapophyses, *g*, appearing as flattened, winglike plates, the apex (Plate 2, fig. 8) bearing two powerful forceps-like teeth, the outer margin of the apophysis microscopically setulose. In *autumna* the apical teeth of the gonapophysis (Plate 2, fig. 9) consist of two weak denticles that lie side by side, the cephalic edge of the apophysis with a few weak denticles. The gonapophyses of *C. nipponensis* Alexander (Plate 2, fig. 7) are very different in structure.

Habitat.—Japan (Hokkaido).

Holotype, male, Maruyama, near Sapporo, Ishikari-no-kuni, October 6, 1923 (*M. Hori*). Allotopotype, female; paratopotypes, 5 males and females.

Cladura megacauda sp. nov.

General coloration pale pulvous yellow; tips of femora and tibiæ narrowly infuscated; abdomen bicolorous, yellow, the caudal margins of the individual segments narrowly infuscated;

male hypopygium very large, nearly globular in form, with two dististyles.

Male.—Length, about 7 millimeters; wing, 8.4. Basal segments of the antennæ yellow, the flagellum broken. Head yellow.

Pronotum yellow. Mesonotum shiny fulvous yellow, without markings, the lateral margins of the præscutum paler. Pleura pale yellow. Halteres pale, the knobs darkened. Legs with the coxæ and trochanters pale yellow; femora and tibiæ yellow, the tips narrowly but conspicuously infuscated; basitarsi brown, the tips passing into dark brown, the terminal tarsal segments uniformly dark brown; legs conspicuously hairy. Wings (Plate 1, fig. 7) subhyaline, the costal region very slightly more yellowish; veins dark brown, those in the costal region a trifle paler. Venation: Sc_1 ending just beyond the origin of R_2, Sc_2 about three times its own length from the tip; r atrophied, indicated only by a weak spur on R_2; inner ends of cells R_3, R_5, and 1st M_2 in oblique alignment.

Abdomen yellow, the caudal margins of the segments narrowly infuscated to produce a narrowly banded appearance; basal tergites with a narrow dusky median stripe. Male hypopygium very large, the ninth tergite and sternite fused into a globular structure (Plate 2, fig. 5). Region of the ninth tergite (Plate 2, fig. 4) with a deep V-shaped notch, the extreme apex of the V with a smaller rounded notch; lateral lobes of the tergite thus formed extended into acute points; viewed laterally there are seen to be a second pair of stouter, more obtuse lobes of equal length immediately ventrad of the first pair. Sternal region, *s*, with a very broad V-shaped notch, the margin with abundant, conspicuous yellow setæ. Basistyle, *b*, slender, on the ventro-mesal face of each with two lobes. Two dististyles; outer dististyle, *od*, shorter, fleshy, the inner edge with long erect setæ; inner dististyle, *id*, longer and slenderer, narrowed distally, the basal portion with conspicuous erect setæ, the apex of the style curved.

Habitat.—Japan (Hokkaido).

Holotype, male, Sapporo, Ishikari-no-kuni, end of August, 1925 (*Kuwayama*).

Cladura megacauda is readily distiguished from all known species of *Cladura* by the very large and complicated male hypopygium.

Dactylolabis gracilistylus sp. nov.

General coloration dark gray; præscutum with four brown stripes; pleura clear gray; wings of male strongly infumed; male hypopygium with the long slender basistyle more than twice the length of the outer dististyle.

Male.—Length, 7.2 millimeters; wing, 7.8.

Female.—Length, about 6.8 to 7 millimeters; wing, 7.3 to 7.5.

Rostrum and palpi dark brown. Antennæ black throughout, the basal segment slightly pruinose; flagellar segments oval, very distinctly separated. Head light blue-gray with a small fuscous spot on the anterior vertex from which a capillary vitta extends caudad to the occiput. In the female this capillary line is less clearly defined.

Pronotum brownish gray, clearer gray laterally. Mesonotal præscutum gray with four narrow dark brown stripes; posterior sclerites of mesonotum darker gray. Pleura clear gray. Halteres dark brown, the base of the stem narrowly yellow. Legs with the coxæ light gray; trochanters brown, sparsely pruinose; legs brownish black, the femoral bases only a trifle paler. Wings (Plate 1, fig. 8) with a strong dusky tinge, the stigma and vague seams on the anterior cords still darker; veins dark brown, with conspicuous obliterative areas at the end of Rs and along the cord. Venation: Sc_1 ending immediately before the fork of Rs, Sc_2 at its tip; r at tip of R_1 and just beyond midlength of R_2; petiole of cell M_1 equal to the cell; m-cu at fork of M; arculus punctiform, veins R, M, and Cu being approximated at origin. In the type male, in both wings, veins M_1 and M_2 before the wing margin unite and fuse for a short distance back from the margin, forming an elongate-oval cell M_1. The type of the related *D. longicauda* Alexander, of Japan, exhibits the same peculiarity.

Abdomen of male elongated, dark gray, the hypopygium dark. Male hypopygium (Plate 2, fig. 3) with the basistyles very elongate and slender, more than twice as long as the outer dististyle, the latter nearly straight, stout; inner dististyle slenderer, curved.

In the females that are referred to this species a rather noteworthy difference in coloration from that in the male is found. The femora and tibiæ are light brown with blackened tips. The wings are paler with the brown clouds along the cord more evident. Cell 1st M_2 more elongate; cell M_1 varying

from relatively short to more than twice the length of the petiole. Halteres more uniformly pale in color.

Habitat.—China (Che-kiang).

Holotype, male, hills south of Ning-po, May 1, 1925 (*Suenson*). Allotopotype, female; paratopotypes, 1 male, 1 female.

Limnophila (Ephelia) suensoni sp. nov.

Male.—Length, about 6 millimeters; wing, 7. Generally similar to *L.* (*E.*) *dietziana* Alexander (Honshiu, Japan) but notably larger and with differences in coloration and structure of the male hypopygium.

Antennæ with the scape brownish black; basal flagellar segments light yellow, the intermediate segments bicolorous, the bases of the segments being slightly darkened. Præscutal pattern very similar, but the anterior ends of the intermediate stripes subobsolete. The black apical rings of the femora are slightly paler at their extreme tips so that the black annuli appear narrower and subterminal in position. Wings with the same abundant dotted pattern, the apical fascia (in ends of cells R_2 to M_1) tending to be broken into blotches. Venation: The supernumerary crossvein in cell M lies shortly beyond the level of the origin of Rs and opposite the end of vein 2d A. Male hypopygium with the outer dististyle weakly setiferous, as in *dietziana*, but the apical hook short and only gently curved. The differences between the species concerned are shown by the dististyles in figures on Plate 2 (fig. 14, *subaprilina* Alexander; fig. 12, *dietziana* Alexander; fig. 13, *suensoni* sp. nov.).

Habitat.—China (Che-kiang).

Holotype, male, hill south of Ning-po May 1, 1925 (*Suenson*).

This handsome crane fly is named in honor of the collector, Mr. E. Suenson, to whom I am indebted for many species of Tipulidæ from eastern China.

Genus **TROGLOPHILA** Brunetti

1924. *Troglophila* BRUNETTI, Rec. Ind. Mus. 26: 99–100.
1925. *Esakiomyia* ALEXANDER, Ann. & Mag. Nat. Hist. IX 15: 73–74.

Brunetti proposed the name *Troglophila* (as a subgenus of *Limnophila*) for a peculiar fly from the Garo Hills, Assam. The following year, I erected the genus *Esakiomyia* for a Japanese species of the same group. There is some question in

my mind as to whether the orthopteran genus *Troglophilus* Krauss.,[2] having quite the same derivation, does not preclude the use of *Troglophila* Brunetti, despite the termination. However, until some agreement is reached as to what constitutes a preoccupied name, the genus *Esakiomyia* is placed in the synonymy.

As now constituted, *Troglophila* includes four species, which occur in China, Japan, Assam, and Borneo. These species may be separated by the following characters:

1. m-cu some distance before the fork of M; vein 1st A relatively short, ending opposite the fork of M. (Assam.)..... **cavernicola (Brunetti).**
   m-cu at or close to the fork of M; vein 1st A longer, extending to beyond one-third the length of cell 1st M_2..... 2.
2. Cell M_1 normally present; penultimate and ultimate sections of vein R_1 subequal, or the latter longer. (China.)..... **seticornis sp. nov.**
   Cell M_1 lacking; ultimate section of vein R_1 about one-half the length of the penultimate section..... 3.
3. Sc relatively short, Sc_1 ending opposite the fork of Rs; macrotrichiæ of veins long and conspicuous. (Japan.)..... **filicornis (Alexander).**
   Sc longer, Sc_1 ending between one-third and one-fourth the length of R_{2+3}; macrotrichiæ of veins inconspicuous. (Borneo.)
   monticola Edwards.

Troglophila monticola is known to me only by the proof sheets of Mr. Edwards's paper on the Bornean Nematocera, which was to have appeared in the Sarawak Museum Journal, volume 2, part 4, No. 8, for 1924. Mr. Edwards informs me that the paper had not appeared in press by the middle of 1925. The proof sheet supplies an excellent figure of the wing, indicating a species generally similar to *T. filicornis*, but differing as indicated above. It is probable that the description, when available, will furnish other differences of size, structure, and coloration between the two species.

The generic characters of *Troglophila* may now be recast as follows:

Rostrum very short. Antennæ elongate, filiform, presumably 16-segmented, the suture between the last two segments obsolete or nearly so; scapal segments very small; flagellar segments elongate-cylindrical, clothed with a short erect pubescence and inconspicuous verticils. Anterior vertex broad. Pronotum small and inconspicuous. Mesonotum with the tuberculate pits elongate, approximated or contiguous at the median line, lying slightly anterior to the level of the pseudosutural foveæ. Middle

[2] Sitzber. Akad. Wiss. Wien 78 [1] (1879) 533.

and posterior coxæ closely approximated. Tibial spurs slender. Wings with Sc ending opposite or slightly beyond the fork of Rs, Sc_2 at the tip of Sc_1; r on R_2, far removed from the tip of R_1; cell M_1 present (*seticornis*) or lacking; m-cu before (*cavernicola*) or close to the fork of M; anterior arculus present. Longitudinal veins of wing with macrotrichiæ almost to wing base. Male hypopygium of simple structure; dististyles two. Ovipositor entirely fleshy, the base cylindrical, the tiny tergal valves lying transversely, each terminating in a small spinous point.

Genotype, *Limnophila* (*Troglophila*) *cavernicola* Brunetti (Oriental Region).

Troglophila seticornis sp. nov.

General coloration light brownish yellow; head grayish brown; antennæ of male fully one-half longer than the body; wings with a faint brownish tinge; penultimate and ultimate sections of vein R_1 subequal or the latter a little longer; cell M_1 normally present; m-cu at or close to the fork of M.

Male.—Length, 3.8 to 4.5 millimeters; wing, 5.3 to 5.5; antenna, 6 to 7.

Female.—Length, 4 to 4.5 millimeters; wing, 5.1 to 5.8; antenna, 1.9 to 2.

Rostrum obscure yellow; basal segment of palpus brownish yellow, the remaining segments dark brown. Antennæ setiform, dark brown throughout; in male 15-segmented, the first flagellar segment shorter than the second, the second shorter than the third; beyond the third the segments gradually decrease in length to the end, the terminal segment elongate, approximately as long as the penultimate and probably the result of fusion of two segments. In the female the antennæ are indistinctly 16-segmented, the elongate terminal segment being weakly divided at near two-thirds the length. Head grayish brown.

Pronotum infuscated. Mesonotum light brownish yellow, the lateral margins of the præscutum somewhat paler; pseudosutural foveæ pale. Pleura testaceous yellow, the dorsal pleurites slightly infuscated. Halteres pale brown, the base of the stem narrowly yellow. Legs with the coxæ and trochanters yellowish testaceous; remainder of legs pale brown, the terminal tarsal segments darker. Wings (Plate 1, fig. 9) with a faint brown tinge; veins slightly darker brown. Macrotrichiæ present on all the longitudinal veins beyond the arculus except the extreme

bases of M, Cu, and 2d A; Cu_2 without trichiæ as in all known Tipulidæ. Venation: Sc relatively short, Sc_1 ending about opposite one-third the length of R_{2+3}, Sc_2 at its tip; in a few cases Sc is shorter, ending more nearly opposite the fork of Rs; penultimate section of vein R_1 shorter than or subequal to the ultimate section, cell 2d R_1 thus being very deep; cell M_1 normally present, small; in a few cases cell M_1 is lacking but in such instances the tip of vein M_{1+2} is asymmetrical, with usually the anterior of the branches (M_1) preserved, the posterior branch (M_2) being atrophied or with only a marginal trace present; m-cu close to the fork of M; cell 1st M_2 rectangular, gently widened outwardly; cell 2d A broad.

Abdominal tergites dark brown, somewhat paler laterally; sternites obscure yellow.

Habitat.—China (Che-kiang).

Holotype, male, hills south of Ning-po, May 1, 1925 (*Suenson*). Allotopotype, female; paratopotypes, 6 males and females.

TIPULINÆ

Oropeza shirakiella sp. nov.

Female.—Length, 12 to 13 millimeters; wing, 11 to 11.5. Generally similar to *O. candidipes* Alexander (Honshiu, Japan), differing especially in the antennæ and coloration.

Antennæ much shorter. Flagellar segments beyond the first bicolorous, the basal portion of each segment dark brown, the distal portion paler, the terminal segments passing into uniform brown. Præscutum with four stripes; the median vitta of *candidipes* broadly divided by a line of the ground color. Legs with the fore and middle tibiæ strongly infuscated, the narrow base and broader apex of each snowy white; posterior tibiæ entirely snow white; all tarsi white. Wings with the ground color more saturated, especially the costal region which is strongly infumed; prearcular cells largely dark; white prestigmal and poststigmal spots very conspicuous. Abdominal tergites dark brown, the basal rings of the individual segments slightly paler; sternites obscure testaceous yellow, the caudal margins of the segments a little darker.

Habitat.—Taiwan.

Holotype, female, Tamaru (Rato), August 31, 1923 (*T. Shiraki*). Paratopotype, female.

This handsome *Oropeza* is named in honor of Prof. Tokuichi Shiraki, entomologist for Formosa, to whom I am greatly indebted for many kind favors.

Tipula acifera sp. nov.

Belongs to the *annulicornis* group; size very small (wing less than 10 millimeters); antennæ (male) elongate, bicolorous; mesonotal præscutum brownish yellow with three brown stripes, the median stripe paler in front and split by a capillary brown vitta; pleura dark brown; male hypopygium with the median lobe of the tergite cylindrical, gradually narrowed to the blunt tip.

Male.—Length, 8 millimeters; wing, 8.5; antenna, about 4.2.

Female.—Length, 10 millimeters; wing, 9.

Frontal prolongation of the head short, brown, the nasus very short; palpi dark brown. Antennæ elongate in the male, if bent backward extending about to one-third the length of the abdomen; first scapal segment obscure yellow, the second segment light yellow; flagellum bicolorous, the second flagellar segment and those following with the basal enlargement dark brown, the remainder of each segment yellow. In the female the antennæ extend about to the wing root. Head grayish brown, more yellowish anteriorly. In the female the anterior vertex is split by a distinct capillary blackish vitta, the posterior orbits narrowly pale.

Pronotum dark brown. Mesonotal præscutum brownish yellow with three brown stripes, the lateral stripes entire, the median stripe entire only at the caudal end, the anterior end becoming subobsolete, the margins and a capillary median line remaining dark brown; scutum brownish testaceous, the centers of the lobes dark brown; scutellum testaceous, the surface more or less pollinose. Pleura dark brown. Halteres yellow, the knobs dark brown, their apices paler. Legs with the coxæ brown basally, the apices passing into obscure yellow; trochanters obscure yellow; fore femora dark brown, the bases narrowly obscure yellow; middle and hind femora brownish yellow, the tips rather narrowly infuscated; tibiæ and tarsi dark brown. In the female the femora are more extensively and uniformly darkened. Wings (Plate 1, fig. 10) with a faint brown tinge; cells C and Sc slightly darker; stigma oval, dark brown; narrow darker seams along Rs, the cord, and veins R_{4+5}, Cu, and 2d A;

conspicuous obliterative areas before the cord, extending from before the stigma, crossing cell 1st M_2 into the base of cell M_3; a conspicuous pale spot beyond the stigma in cells 2d R_1 and base of R_2; veins dark brown, more yellowish just before the stigma; the veins in the obliterative areas are so pale as to be almost invisible, especially the basal deflection of M_3. Venation: Cell 1st M_2 very small, relatively narrow, m being from one-third to one-half the length of the basal section of M_{1+2}; cell M_1 deep; vein 2d A relatively long, extending to about opposite two-thirds the length of the first section of vein Cu_1.

Abdominal tergites obscure fulvous yellow, the segments margined laterally and caudally with black, the median line of the tergites more or less infuscated, restricting the ground color to the sublateral regions of the sclerites; sternites obscure fulvous yellow, the caudal margins of the segments narrowly ringed with dark brown, the eighth sternite entirely blackened; hypopygium light brown. Male hypopygium with the median region of the tergite produced caudad into a slender blackened cylindrical rod that narrows gradually to the narrow blunt tip.

Habitat.—Japan (Shikoku).

Holotype, male, Mount Ishitsuchi, altitude 1,000 meters, August 10, 1925. Allotopotype, female.

Tipula acifera is allied to *T. insulicola* Alexander, *T. nikkoensis* Alexander, and *T. sparsiseta* Alexander, differing in the small size and structure of the male hypopygium. The fly was included in some interesting species from Shikoku sent to me by Professor Harukawa.

Tipula cylindrostylata sp. nov.

Belongs to the *nipponensis* group; closely allied to *T. querula* Alexander (Japan), differing in the more elongate antennæ and the structure of the hypopygium, especially the feebly notched tergite and the long curved outer dististyle.

Male.—Length, about 11 millimeters; wing, 12.5; antenna, about 4.

Female.—Length, about 12 millimeters; wing, 12.

Frontal prolongation of the head clear light yellow, the palpi beyond the basal segment dark brown; nasus long and slender. Antennæ (male) relatively elongate, if bent backward extending to beyond the base of the abdomen; flagellar segments uniformly blackened. Pleura with the sternopleurite and anepisternum extensively darkened. Wings somewhat darker, the pale areas more clearly delimited, five in number; namely, pre-

stigmal, poststigmal, cell 1st M_2, outer end of cell M, and the outer end of cell 1st A near vein 2d A. Venation: Cell 1st M_2 somewhat smaller.

Abdominal tergites bicolorous, dark brown, the bases of the segments obscure yellow, the amount more extensive on the basal segments, this coloration becoming more restricted behind; basal sternites more uniformly yellow. Male hypopygium (Plate 2, fig. 15) with the ninth tergite, *t*, simple, the caudal margin gently notched. Outer dististyles, *od*, very long and slender, curved mesad, pale throughout, their surfaces with conspicuous erect setæ. Inner dististyles, *id*, viewed laterally simple, the apex produced into an acute point.

Tipula querula has the ninth tergite with a conspicuous U-shaped median notch, the margin of which is blackened, the base untoothed; outer dististyle of moderate length only.

Habitat.—China (Che-kiang).

Holotype, male, hills south of Ning-po, May 1, 1925 (*Suenson*). Allotopotype, female; paratopotype, male.

There can be little question that flies of this general type were the ancestors of *Nesopeza* Alexander, *Mitopeza* Edwards, and through them the remaining Dolichopezaria.

Tipula yamamuriana sp. nov.

General coloration gray, the præscutum with three brown stripes; antennæ bicolorous; wings with a strong brownish tinge; stigma dark brown; pale areas before the cord and including the basal half of cell M; abdominal tergites with brown sublateral stripes.

Female.—Length, 28 millimeters; wing, 23.5. Frontal prolongation of the head dark gray, the nasus elongate; palpi dark brown, the incisures slightly paler. Antennæ with the basal segment elongate, heavily pruinose; second segment brown; flagellar segments bicolorous; first flagellar segment black, obscure brownish yellow at both ends; succeeding flagellar segments black basally, the apical portion brownish yellow, the amount of black gradually increasing outwardly, the terminal segments uniformly infuscated; flagellar segments only moderately incised beneath; verticils conspicuous. Head light gray; vertical tubercle obsolete.

Pronotum light gray. Mesonotal præscutum clear light gray with three brown stripes, the lateral stripes short and narrow, of a paler brown than the median area; median stripe V-shaped, the anterior portion being invaded by an acute triangle of the

ground color; scutum gray, each lobe with a single large brown spot; scutellum pale whitish gray; postnotal mediotergite whitish gray, the median area vaguely darkened. Pleura gray, the pleurotergite with a brown spot on the tumid ventral portion. Halteres brown, the base of the stem paler. Legs with the coxæ pale, white pruinose; trochanters obscure yellow; femora reddish brown, the tips passing into black; tibiæ light brown, the tips broadly blackened; tarsi dark brown, passing into black; tibial spurs very slender; tarsi a little longer than the tibiæ. Wings with a strong brownish tinge, the base and cells C and Sc more yellowish; stigmal region very conspicuous, dark brown; whitish subhyaline areas before the cord, including cells 1st R_1, the outer fifth of R, the proximal half of 1st M_2, and the extreme basal portions of cells M_3 and M_4; a second conspicuous pale wash includes the entire basal half of cell M; veins black, brown in the costal region; obliterative areas including the end of Rs, and the basal sections of veins M_{1+2}, and M_3. Venation: Cell R_2 acute at origin, both sections of vein R_2 being approximately in alignment; cell 1st M_2 broad and ample, the cephalic margin gently arcuated; the obliterative sections that surround the cell subequal in length; m and petiole of cell M_1 subequal.

Abdominal tergites dark gray with a broad sublateral brown stripe on either side, the lateral margins broadly, the caudal margins more narrowly, ocherous; the brown sublateral stripes are interrupted or nearly so by the conspicuous blackened impressed basal areas at the sides of the tergites; the gray median area of the tergum begins on the third segment and continues to the end of the abdomen; the brown sublateral stripes become narrowed behind, obsolete on the sixth tergite; sternites brownish gray basally, the outer sternites clearer gray, the caudal margins of the segments narrowly and indistinctly pale. Ovipositor with the basal shields shiny black; valves brownish horn color, all valves smooth; tergal valves slender.

Habitat.—Japan (Honshiu).

Holotype, female, Kurashiki, Okayama-Ken, along a woodland brook, altitude 15 meters, May 27, 1925 (*Harukawa*).

Tipula yamamuriana is apparently most closely allied to *T. kuzuensis* Alexander. It was associated with other vernal crane flies at Kurashiki, especially with *Erioptera* (*Ilisia*) *asymmetrica* Alexander, *Pseudolimnophila inconcussa* (Alexander), *Limnophila* (*Ephelia*) *subaprilina* Alexander, *Tipula nipponensis* Alexander, *T. yamata* Alexander, and *T. aino* Alexander.

The fly bears a rather marked superficial resemblance to *T. aino* but differs in the wide cell 1st M_2 and the conspicuous pale base to cell M.

I dedicate this fly to the memory of Shôzaburo Yamamura, the first native Japanese student of the Tipulidæ. I am indebted to Prof. Teiso Esaki for an account of Yamamura's life, of which a brief summary is given herewith:

Shôzaburo Yamamura was born in either 1893 or 1894 in Minakuchi, Kôga-gun, Province of Omi, of Christian parents. He studied in the Minakuchi Agricultural and Dendrological School and graduated therefrom in March, 1912. During his school days he was one of the leaders of the Minakuchi Boys Entomological Society, founded in 1910, with more than fifty members in various parts of Japan. Upon his graduation, in 1912, he entered Nawa's Entomological Laboratory in Gifu as an entomological assistant. In April, 1915, he moved to the Forestry Institute of Keikidô, Keijô, Chosen, where he died of typhoid fever on December 5, 1915. There can be no question that in the death of Yamamura, Japanese entomology lost one of the most promising of its younger students. Although his early work was devoted to the Lepidoptera, especially the Lithosiidæ, he later had turned his whole attention to the Tipulidæ with the intention of becoming Japan's authority on the group. Only his early decease prevented his attaining this position. Yamamura had amassed a large and valuable collection of Tipulidæ at the time of his death, but this has entirely disappeared. In 1918 and later, through the kind efforts of Dr. Akio Nohira and Professor Esaki, I tried to locate this collection, which, according to Doctor Nohira, included in excess of one hundred species, but this search was unavailing. A portrait of Yamamura is given in the Entomological Magazine (Kyoto) 2 (1916) 64.

ILLUSTRATIONS

[Legend: *A*, anal veins; *b*, basistyle; *Cu*, cubitus; *d*, dististyle; *dd*, dorsal dististyle; *g*, gonapophysis; *id*, inner dististyle; *M*, media; *od*, outer dististyle; *R*, radius; *Sc*, subcosta; *t*, tergite; *vd*, ventral dististyle. Venational terminology used: Comstock-Needham-Tillyard. Hypopygial terminology used: Crampton.]

PLATE 1

FIG. 1. *Dicranomyia paramorio* sp. nov., wing.
2. *Antocha* (*Antocha*) *confluenta* sp. nov., wing.
3. *Orimargula flavella fuscolineata* subsp. nov., wing.
4. *Erioptera* (*Erioptera*) *harukawai* sp. nov., wing.
5. *Gonomyia* (*Ptilostena*) *kuwayamai* sp. nov., wing.
6. *Gonomyia* (*Ptilostena*) *sachalinensis* Alexander, wing.
7. *Cladura megacauda* sp. nov., wing.
8. *Dactylolabis gracilistylus* sp. nov., wing.
9. *Troglophila seticornis* sp. nov., wing.
10. *Tipula acifera* sp. nov., wing.

PLATE 2

FIG. 1. *Dicranomyia paramorio* sp. nov., male hypopygium.
2. *Antocha* (*Antocha*) *confluenta* sp. nov., male hypopygium.
3. *Dactylolabis gracilistylus* sp. nov., male hypopygium.
4. *Cladura megacauda* sp. nov., male hypopygium, dorsal.
5. *Cladura megacauda* sp. nov., male hypopygium, lateral.
6. *Cladura bidens* sp. nov., male hypopygium.
7. *Cladura nipponensis* Alexander; gonapophysis.
8. *Cladura bidens* sp. nov., gonapophysis.
9. *Cladura autumna* Alexander; gonapophysis.
10. *Cladura autumna* Alexander; tergite.
11. *Molophilus velvetus* sp. nov., male hypopygium.
12. *Limnophila* (*Ephelia*) *dietziana* Alexander; outer dististyle.
13. *Limnophila* (*Ephelia*) *suensoni* sp. nov., outer dististyle.
14. *Limnophila* (*Ephelia*) *subaprilina* Alexander; outer dististyle.
15. *Tipula cylindrostylata* sp. nov., male hypopygium.

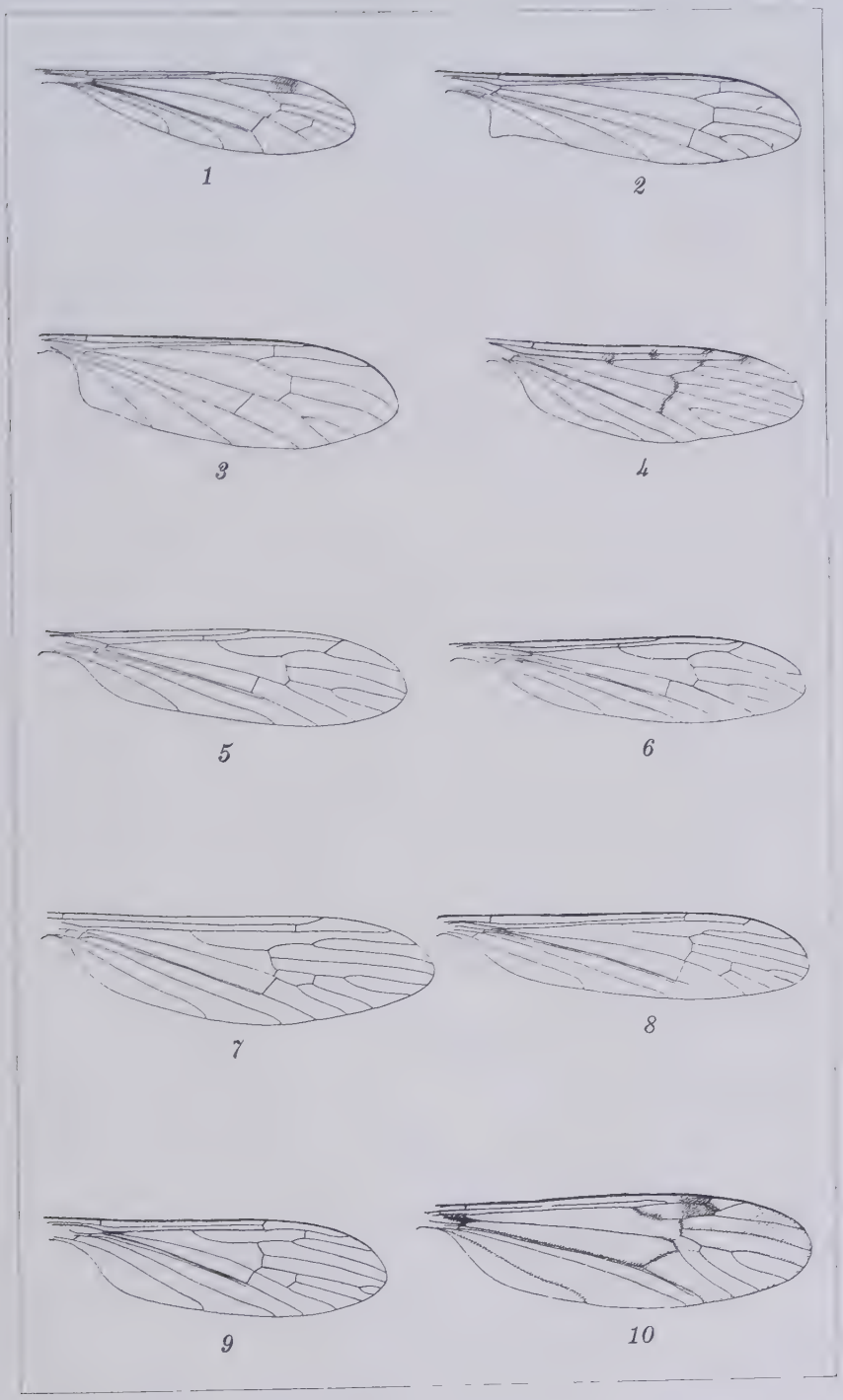

PLATE 1.

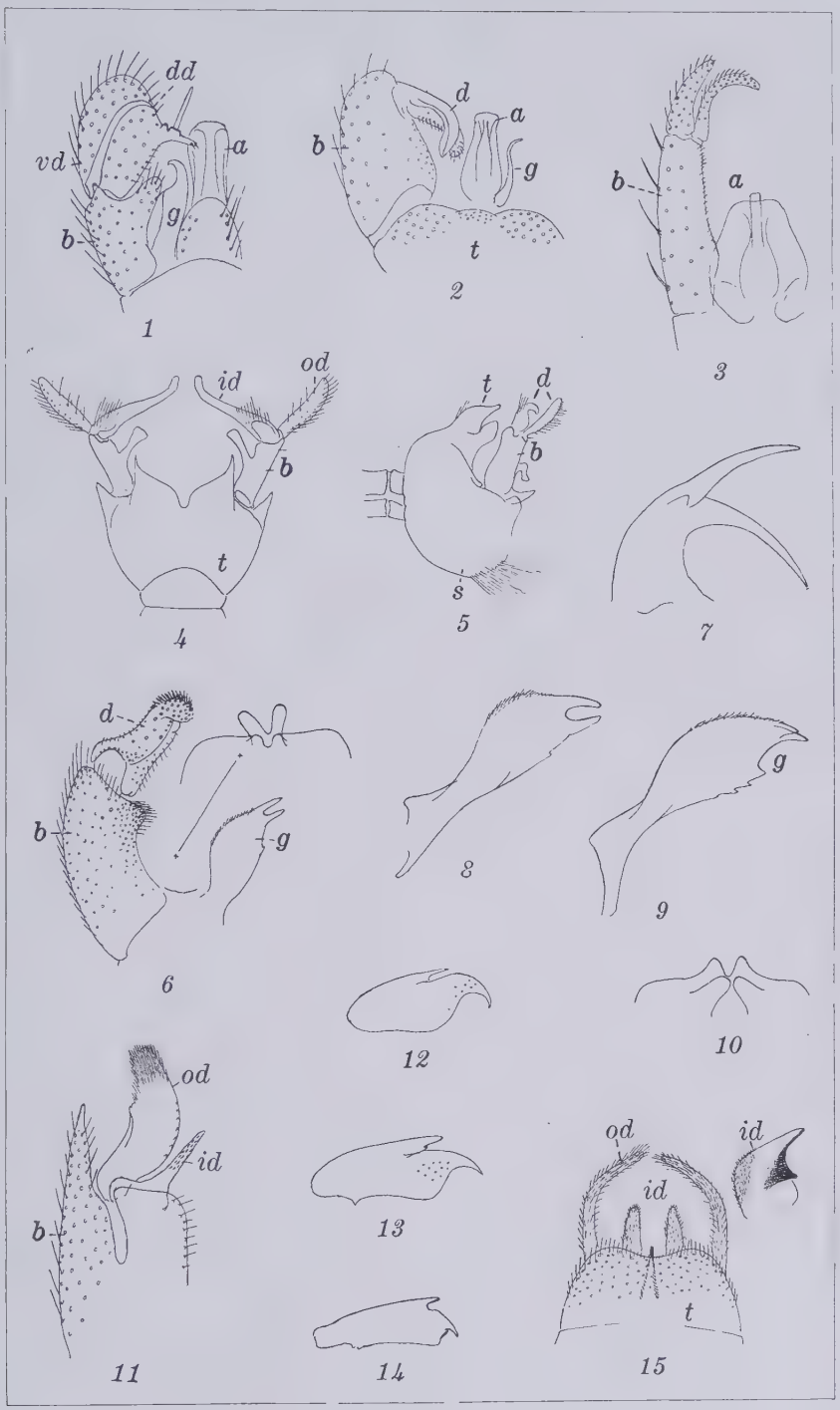
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PLATE 2.

A SUMMARY OF THE PHILIPPINE CATFISHES, ORDER NEMATOGNATHI

By Albert W. Herre

Chief, Division of Fisheries, Bureau of Science, Manila

ONE PLATE

In this paper the Philippine catfishes of the families Plotosidæ and Ariidæ are described. They are recognized at sight by the long barbels, or feelers, borne by the rudimentary maxillaries, and by the absence of scales. There are usually other long feelers, or barbels, around the mouth, snout, or chin, the name catfish being applied because these barbels suggest the whiskers of a cat. The body is covered with thick slimy skin, and many of the Philippine species have bony plates on top of the head. Some of the South American catfishes also have the body more or less completely covered with bony plates. Other distinctive characters are present in the skeleton, but the external characters are enough to distinguish the order. In nearly all catfishes the front of the dorsal and pectoral fins is modified into a strong, sharp, often serrated spine, which moves in its socket with a rotary motion; when erect, the spines are locked so that they cannot be lowered forcibly except by breaking them. If lifted upward and inward with a twisting motion the spine can be lowered. In two North American genera the pectoral spines have a basal poison gland from which venom is injected into the wound made by them. Other catfishes may cause painful injury, due to the jagged wound and the entrance into it of slime, but they are not venomous.

Most of the catfishes have an adipose fin behind the dorsal, as do the fishes of the salmon family.

Catfishes are greedy fishes, and with few exceptions are bottom dwellers, of sluggish habits; they are primarily carnivorous but ready to gobble up anything they can swallow. In other regions occur catfishes of gigantic size, nearly or quite 2 meters in length and 100 kilograms in weight. The Philippine species are mostly small to medium size, only one or two reaching a length of 0.75 meter.

Of the four families found in Philippine waters two have been treated by me in a paper [1], in which full descriptions of the species are given.

Key to the families of Siluroidea occurring in the Philippines.

a^1. Dorsal spineless; anal very long.
  b^1. Dorsal many-rayed; four pairs of barbels; top of head with bony plates ..... Clariidæ.
  b^2. Dorsal very short, rudimentary, or even absent; two or three pairs of barbels; no bony plates on head..... Siluridæ.
a^2. Dorsal with a sharp-pointed spine.
  b^1. Caudal pointed, the long second dorsal and anal confluent with it; no adipose fin..... Plotosidæ.
  b^2. Caudal forked, widely separated from the adipose fin and short anal; gill membranes united with isthmus..... Ariidæ.

PLOTOSIDÆ

This family of catfishes is readily recognized by the following characters: The first dorsal has a strong sharp spine, and the long, many-rayed second dorsal and anal are confluent with the pointed caudal.

The body is elongate with very tapering tail and depressed head; the first dorsal is above or behind the origin of the pectorals and its spine may be smooth, or serrated on both edges or behind only; there is no adipose fin and the second dorsal is perhaps a forward extension of the caudal; the pectorals may have a strong, sharp-pointed, and barbed spine or a rather weak one; the ventrals have ten or twelve rays; the nostrils are far apart, the front pair usually tubulate, either in the front border of the upper lip and looking up or forward, or perforating it and opening downward; the posterior nostril is a slit behind the maxillary barbel; there are three pairs of barbels, maxillary, mandibulary, and mental or under the chin; a lateral fold at the corner of the mouth may be produced into a short barbel; both jaws with conical teeth, which may be absent in the upper jaw or mixed with molarlike ones in the lower jaw; the vomerine teeth may be molariform or conical, in a patch or a band; the lateral line is more or less conspicuous, the pores far apart; a dendritic organ behind the anus is present in some genera; the gill membranes may be united or more or less separated, and may be free from or partially or completely united with the isthmus.

[1] Philip. Journ. Sci. 24 (1924) 697–705.

Of the six East Indian genera known, but two occur in the Philippines, one represented by a single species, the other by two. Of the sixteen species recognized by Weber and Beaufort in the Indo-Australian Archipelago eleven belong to the fauna of New Guinea. It is not likely that more than a single additional member of the Plotosidæ will be found in Philippine waters.

Key to the Philippine genera of Plotosidæ.

a^1. Anterior nostrils perforating upper lip and opening downward, with a prominent lip..... **Paraplotosus.**

a^2. Anterior nostrils tubular, erect or directed forward but never opening downward on underside of lip..... **Plotosus.**

Genus **PARAPLOTOSUS** (Bleeker) de Beaufort

Paraplotosus Bleeker, Atlas Ichth. 2 (1862) 100, name only; De Beaufort, Bijdr. Dierk. Afl. 19 (1913) 97; Weber and Beaufort, Fishes Indo-Austr. Arch. 2 (1913) 224.

Body elongate, tapering posteriorly, with depressed head, rounded anteriorly; mouth transverse, with thick lips densely covered with long papillæ and vermiculated folds; the very prominent upper lip perforated near its inner margin by the anterior nostrils, which open downward and have a very prominent lip elongated anteriorly; a maxillary barbel near the end of upper lip, a mandibulary barbel below the corner of mouth, and a pair of barbels on chin between the two mandibulary barbels; eye not covered by skin; first dorsal short, behind origin of pectorals, with four or five rays and a strong spine, toothed before and behind; origin of second dorsal before or above that of ventrals, the latter with twelve or thirteen rays; maxillary teeth conical with rounded tips, in two rhombic patches with rounded sides, the median teeth strongest; teeth in lower jaw in two patches, together forming an arch, very narrow posteriorly; vomerine teeth molar, in a crescentic patch; a very conspicuous dendritic organ between the anus and anal fin; twenty-two gill rakers on the first arch; the second and third gill arches have a series of long cartilaginous processes which cover the base of the gill laminæ on the sides facing each other; the gill membranes confluent in the middle, only the anterior part of the confluent portion joined to the isthmus; branchiostegals nine to eleven.

But one species known.

Paraplotosus albilabris (Cuvier and Valenciennes).

Plotosus albilabris CUVIER and VALENCIENNES, Hist. Nat. Poiss. 15 (1840) 316; BLEEKER, Atlas Ichth. 2 (1862) 99, pl. 96, fig. 1.
Plotosus macrophthalmus BLEEKER, Verh. Bat. Gen. 21[1] (1847) 179.
Copidoglanis albilabris GÜNTHER, Cat. Fishes 5 (1864) 26.
Paraplotosus albilabris WEBER and BEAUFORT, Fishes Indo-Austr. Arch. 2 (1913) 225, figs. 88, 89, and 90.

First dorsal 1–4 or 5; second dorsal 95–110; anal 90–100; pectoral 1–12 or 13; ventral 12 or 13; gill rakers 17+6.

The low elongate body strongly compressed laterally, its depth 6.7 to 7.4 in the length; the broad, blunt head much depressed forward, high posteriorly, 4.75 to 5.4 times in the length, its breadth 1.33 to 1.7 times in its length and 1.3 to 1.45 times in its depth; the wide, bluntly rounded snout 2.45 to 2.6 times in the head; the dorsolateral eyes far apart, looking upward as well as sideways, 4.7 to 5.66 times in the head, 1.8 to 2.3 times in the snout, and 1.1 to 1.5 times in the interorbital, which may be flat or concave; the teeth of the front row in the maxillary long, stout, conical, the others similar but much smaller; the vomerine teeth coarse, rounded, the posterior or fourth row very large, molariform; the teeth in the lower jaw in two patches separated by a deep but rather narrow space, together forming a crescent-shaped band of four rows which becomes one posteriorly; the outer row longest, of large, conical teeth with rounded tips, the others molariform, those of the posterior row largest, short, broad, flat-topped; the nasal barbels longer than any of the others, 1.33 to 1.75 times in the head, but in my specimens they do not reach to the hind border of the operculum or beyond, as stated by Weber and Beaufort; the maxillary and mental barbels twice in the head; the mandibulary barbels longer, reaching beyond gill opening, 1.6 to 1.88 times in the head; first dorsal 1.5 to 1.6 times in the head, its strong spine smooth or toothed, two-thirds the height of the dorsal, 2.5 to 2.6 times in the head; second dorsal high, thick and fleshy in its anterior third, the anal a little lower; the length of the pectoral equals the first dorsal height, its stout spine smooth or barbed before and behind, almost equal to the first dorsal spine; the ventrals extend upon the anal, 1.88 to 2 times in the head.

The color in alcohol uniform chocolate brown, the fins darker to blackish, the underside of the head and the belly brown to white, the lips white.

Here described from a specimen, 280 millimeters long, from Culion; one, 265 millimeters long, from Sitankai; and six fine specimens, 173 to 232 millimeters long, from Bantayan Island.

I have seen many specimens in the fish market at Jolo, Sulu Province, and it seems to be rather common in the southern Philippines.

This marine catfish occurs throughout the East Indies.

Genus PLOTOSUS Lacépède.

Plotosus LACÉPÈDE, Hist. Nat. Poiss 5 (1803) 129.

Vernacular names.—English, catfish; Bikol, iito; Ilokano, nito; Samal, tauti; Tao Sug, bak'c and tauti; Visayan, iito; Visayan of Siquijor, parigas.

The elongate body strongly compressed laterally, the head depressed anteriorly, bluntly rounded; the thick lips covered with papillæ or small folds; the prominent upper lip perforated by the anterior nostril which opens upward as a short tube; the barbels as in *Paraplotosus;* the eyes not covered by skin; the teeth of the upper jaw conical, in a narrow, rectangular band; those in the mandible are mixed with molar teeth and form a semilunate band; the molariform vomerine teeth are in a crescentic band; first dorsal short, behind the origin of the pectorals, with four or five rays and a strong spine denticulated before and behind; second dorsal begins between the origin of the ventrals and anal; the pectoral spine toothed; the lateral line well developed; twenty to twenty-eight gill rakers on the entire first branchial arch; the gill membranes are free from the isthmus, nearly totally separate at the middle; a conspicuous dendritic organ between the anus and anal; branchiostegals nine to twelve.

These catfishes are well and unfavorably known to fishermen, as their jagged spines inflict severe wounds. I regard them as marine fishes which, though they stray into estuaries and rivers, never go far from the sea. Of the four or five species of this Indo-Pacific genus two occur in the Philippines.

Key to the Philippine species of Plotosus.

a^1. Nasal barbel extending beyond eye; dorsal 130 to 140; anal 106 to 118; uniform brown; teeth of lower jaw in four or five rows. **P. canius.**

a^2. Nasal barbel not reaching beyond rear margin of eye; dorsal 80 to 100; anal 70 to 80; lower jaw teeth in two or three rows; color brown or with two white longitudinal bands..... **P. anguillaris.**

Plotosus canius Buchanan Hamilton.

Plotosus canius Buchanan Hamilton, Fishes Ganges (1822) 142; Cuvier and Valenciennes, Hist. Nat. Poiss. 15 (1840) 315; Bleeker, Atlas Ichth. 2 (1862) 99, pl. 96, fig. 2; Günther, Cat. Fishes 5 (1864) 25; Day, Fishes of India (1878) 482, pl. 112, fig. 3; Weber and Beaufort, Fishes Indo-Austr. Arch. 2 (1913) 227.
Plotosus unicolor Cuvier and Valenciennes, Hist. Nat. Poiss. 15 (1840) 315.
Plotosus viviparus Bleeker, Arch. Ned. Ind. 3 (2) (1846) 182.
Plotosus horridus Bleeker, Arch. Ned. Ind. 3 (2) (1846) 183.
Plotosus multiradiatus Bleeker, Arch. Ned. Ind. 3 (2) (1846) 183.

First dorsal 1–4 or 5; second dorsal 130 to 140; anal 106 to 118; branchiostegals 11 to 13.

The laterally compressed, elongate body tapers to a point posteriorly, its depth 7.1 to 7.9, its head 4.5 to 4.7 in the length; the very broad head depressed anteriorly, with a broad blunt snout; the breadth of the head 1.25 to 1.35 in its length and 1.8 times its depth; the snout 2.8 to 2.85 times in the head; the small dorsolateral eyes look up as well as to the side, 7.1 to 10.4 times in the head, 2.45 to 3.75 times in the snout, and 2.2 to 3.2 times in the flat interorbital; the teeth in the upper jaw small, in three rows; the teeth on the palate are in a crescentic band, the posterior ones largest; the band of teeth in the lower jaw divided by a median toothless space, the teeth in four rows; the dorsal and pectoral spines equal or nearly equal in length, about 2.8 times in the head, smooth or granulate in front except at the upper part; this and the posterior edge are serrate, the point very sharp; the first dorsal and pectoral each a little shorter than snout and eye together, or 2.12 to 2.14 times in the head; the short triangulate ventrals do not reach the anal in the young, but extend beyond its origin in adults, shorter than the snout, 3 times or a trifle more than 3 times in the head; the nasal barbels extend far beyond the eye and may extend beyond the head almost to the base of the dorsal spine. Weber and Beaufort state that the maxillary barbels are longer than the nasal, but in my specimens they are shorter; the mandibulary barbels extend a little beyond the gill opening; the mental barbels are much shorter; gill rakers 17 + 7 or 18 + 6.

The color in alcohol deep chocolate brown above, paler brown below, very much lighter under the head; the second dorsal and anal dark brown, edged with black.

Here described from a specimen, 150 millimeters long, from La Paz, Iloilo, taken in brackish water, and a specimen, 340 millimeters long, from Tacloban, Leyte.

This species occurs in rivers and in the sea; it ranges from Ceylon, Bengal, and the Andamans to New Guinea and the Aru Islands. According to Hamilton it is "often found three feet long and sometimes between four and five." It is considered excellent food. It seems to be very rare in the Philippines, but may have been merely passed by for *Plotosus anguillaris*.

Plotosus anguillaris (Bloch).

Polystacus anguillaris Bloch, Ichty. 11 (1797) 49, pl. 373, figs. 1 and 2.

Plotosus ikapor Lesson, Voy. Coquille, Zoologie, Poisson 2 (1830) 132, pl. 31, fig. 3.

Plotosus marginatus Bennett, in Life of Raffles, Cat. Zool. (1830) 691.

Plotosus lineatus Cuvier and Valenciennes, Hist. Nat. Poiss. 15 (1840) 306.

Plotosus anguillaris Cantor, Journ. Asiat. Soc. Bengal 18 (1850) 1246; Günther, Cat. Fishes 5 (1864) 24; Meyer, Ann. Soc. España Hist. Nat. 14 (1885) 41; Günther, Fische der Südsee 3 (1909) 372; Jordan and Seale, Bull. Bur. Fisheries 26 (1907) 8; Evermann and Seale, Bull. Bur. Fisheries 26 (1907) 56; Seale and Bean, Proc. U. S. Nat. Mus. 33 (1907) 239; Jordan and Richardson, Bull. Bur. Fisheries 27 (1908) 242; Weber and Beaufort, Fishes Indo-Austr. Arch. 2 (1913) 229; Fowler, Proc. U. S. Nat. Mus. 62 (1922) 3.

Plotosus castaneoides Bleeker, Nat. Tijds. Ned. Ind. 2 (1851) 490.

Plotosus arab Bleeker, Atlas Ichthy. 2 (1862) 98, pl. 95, fig. 2; Day, Fishes of India (1878) 483, pl. 112, fig. 4.

First dorsal 1–4 or 5; second dorsal 80 to 100; anal 70 to 77; branchiostegals 12.

The trunk is laterally compressed, its posterior half very much so, and tapers posteriorly to a point, the depth 6.5 to 7.6 times in the length; the large head moderately depressed anteriorly, 4 to 4.25 times in the length, its breadth two-thirds to three-fourths its length and 1.4 to 1.6 times its depth; the long, bluntly rounded, projecting snout 2.3 to 2.6 times in the head; the small lateral eyes 2.3 to 2.8 times in the snout, 1.8 to 3.66 times in the interorbital, and 6 to 10 times in the head; the nasal barbels may scarcely reach the eye or may extend to its hind margin; all the barbels are about the same length; the stout, coarse, conical teeth in the upper jaw are in a crescent-shaped band, of two rows centrally, one at the sides; in large specimens the central teeth become irregular and may appear in three rows; the teeth on the vomer are coarse, blunt, cylindrical, in a crescentic band of three rows centrally, the posterior median ones much the largest; the teeth on the lower jaw in two rows, sometimes with

a third partial row between them, becoming one row laterally, the anterior and lateral teeth strongest, blunt or somewhat hooked in larger specimens; first dorsal 1.7 to 1.8 times in the head, its spine serrated before and especially behind, 1.5 to 1.8 times in the height of the fin and 2.6 to 3.2 times in the head; the pectoral nearly or quite equal to the first dorsal, its spine like the dorsal spine in height and barbs; the ventrals small, not reaching the anal or extending beyond its origin, 2.7 to 3.2 times in the head; the number of gill rakers seems to be variable; I find 21 + 8, 23 + 8, 22 + 7, and 21 + 6.

The color in alcohol varies from blackish brown or chocolate to light reddish brown, paler to whitish beneath, the lips white; a white stripe begins on the tip of the snout and extends back on top of the head and along the side below the dorsal to the caudal; another white stripe begins at the angle of the mouth and runs back along the side, stopping some distance before the caudal; with advancing age one or both of these stripes disappear; the fins are all grown, the second dorsal, anal, and caudal with a black edge.

The Bureau of Science collection contains the following Philippine specimens, ranging in length from 10 to 260 millimeters:

Puerto Galera	15
San Miguel Bay, Camarines Sur Province	2
Bacon, Sorsogon Province	1
Iloilo	1
Estancia, Iloilo Province	1
Siquijor	11
Bantayan Islands	4
Cabalian, Leyte	49
Busuanga	6
Culion	60
Dinagat	8
Camiguin	2
Caldera Bay, Zamboanga Province	8
Zamboanga	21
Davao	1
Samal Island, Davao Gulf	1
Jolo	6
Pearl Bank	132
Sitankai	4
Sibutu	10

This list is a very incomplete representation of the distribution of *Plotosus anguillaris* in the Philippines. There are no specimens from Manila, though the fish is common in the market there, and in fact throughout the Islands. Schools of young,

10 to 160 millimeters in length, swarm about the coral reefs. Vast numbers occur about every coral reef in the Sulu Archipelago; they apparently remain in schools until rather large. Many times I have dislodged schools numbering several hundred individuals from holes in coral masses or under rocks. At Sibutu and about Tawitawi I often caught several hundreds at once. The fish is very good to eat.

Eydoux and Souleyet were the first to collect this fish in the Philippines, at Manila, as listed by Valenciennes; Günther had a specimen from the "Philippine Islands;" Jordan and Seale had specimens from Manila; Evermann and Seale from Bacon, Sorsogon Province, and Jolo; Seale and Bean from Zamboanga; Jordan and Richardson from Cuyo; and Fowler from Cebu and Zamboanga.

From foreign countries the Bureau of Science collection has excellent specimens from Japan; Amoy and Hongkong, China; Sandakan, British North Borneo; and Lord Howe Island.

This is a fish of exceedingly wide range; it occurs from the Red Sea to Zanzibar and Madagascar at the west, eastward to the Samoan and Society Islands in the Pacific, and north to Japan. All the specimens I have seen came from salt or brackish water.

ARIIDÆ

The short dorsal fin has a long sharp spine and seven rays and is placed forward, between the pectorals and ventrals, the latter with six rays; the adipose fin is shorter than the dorsal, opposite the anal, which has fourteen to twenty-six rays; the pectorals are low down, each with a long sharp spine; the caudal is deeply forked; the head is usually depressed or may be conical, and may be covered with skin or with conspicuous bony plates; the nostrils are close together, the posterior one with a valve but not a barbel; usually maxillary, mandibulary, and mental barbels are present; sometimes only maxillary or only mandibulary barbels are present; the mouth is large or small, transverse or crescent-shaped, usually inferior; the teeth on the palate may be villiform, conical, granular, or wanting; on the jaws they may be villiform, conical, or incisorlike, in one or more rows, or in bands or patches; the eyes usually have a free orbital margin, but may be subcutaneous; the gill membranes are united and connected with the isthmus; branchiostegals five to nine.

A large group, represented by only two genera in the Philippines, the species often very difficult to distinguish. The pal-

atal teeth have been used to separate species and to distinguish genera and subgenera. Owing to the great uniformity of color and general appearance of many of the species, the teeth are of fundamental importance in diagnosis, but they are of little worth ofttimes unless one has a series of specimens for examination. The shape and arrangement of the patches of palatal teeth vary much with age; in young stages they may be almost entirely lacking or represented by a few widely separated tiny teeth which later coalesce into large uniform patches. For this reason I cannot recognize such genera as *Netuma, Ariodes, Pseudarius,* etc. Common in shallow bays, estuaries, rivers, and lakes.

Key to the Philippine genera of Ariidæ.

a^1. Teeth present on palate..... Arius.
a^2. No teeth on palate..... Hemipimelodus.

Genus ARIUS Cuvier and Valenciennes

Arius CUVIER and VALENCIENNES, Hist. Nat. Poiss. 15 (1840) 40.

Vernacular names.—English, catfish; Bikol, tabañgoñgo; Ilokano and Tagalog, kanduli; Tao Sug, gagu'k; Visayan, tambañgoñgo and tabanko.

The elongate body more or less laterally compressed, especially posteriorly; the top of the head always has more or less well-developed bony plates with smooth, granular, or rugose surface; on the nape is a large, variously shaped bony plate, the occipital process, its surface likewise smooth, granular, or folded; behind it, usually touching and more or less encircling the base of the dorsal spine, is a bony plate with smooth or rough surface; on the forward part of the top of the head is a median elongate and variously shaped fontanelle, sometimes with secondary lateral ones; snout depressed, upper jaw more or less projecting, mouth moderate to large, straight or curved; the jaw teeth very sharp, villiform, in bands which are entire or divided at the middle and more or less curved, rarely straight; the teeth on the palate may be villiform, conical, granular, or molariform, in one, two, or three groups on each side; the lateral or slightly dorsolateral eyes have a free margin; the gill membranes have a free posterior margin.

A large and difficult genus, the Philippine species apparently not numerous, but several more may be expected when southern waters have been more carefully explored. Owing to the fact that many of the species show great similarity in color and gen-

eral appearance, the teeth are of fundamental importance in diagnosis, but often they are of little worth unless one has a series of specimens for examination. The shape and arrangement of the patches of palatal teeth vary greatly with age in some species; in very young stages they seem to be entirely lacking; they make their first appearance in small patches of a few widely separated teeth, which later coalesce into larger uniform patches typical of the species; sometimes patches normally distinct fuse more or less, usually not losing their identity but at times melting into one with no trace of the original component unit patches.

The species abound in shallow bays and estuaries, and also in fresh-water rivers and shallow muddy lakes. Some of the Philippine species occur in both fresh and salt water; some are thus far known only from the sea; and at least one species, *A. magatensis,* seems to be confined to fresh water.

Though not of first-rate quality, and by no means to be classed with such a choice gastronomic tidbit as the channel catfish of eastern North America, *kanduli* make very acceptable chowder or *gulai.* Immense quantities are caught in shallow bays by means of *baklad,* or fish corrals, and great numbers are captured in Laguna de Bay with traps, nets, and long lines.

Every year, sometimes twice in one year, an epidemic of "red water," due to inordinate quantities of *Peridinium* or some flagellate protozoan, recurs in Manila Bay and causes great mortality among the fishes. Occasionally this happens in Pasig River and the esteros of Manila, or in the great Laguna de Bay. Kanduli seem to be more susceptible to this than other fishes are, and incredible numbers are killed in Laguna de Bay and Pasig River, so that for days tens of thousands float on the surface, their putrid bodies tainting air and water.

The genus is intertropical in its distribution. In many species the males have a very singular mode of incubating the eggs by carrying them in the mouth until hatched. The eggs are few in number and very large, comparatively speaking. Manifestly eating and this strange domestic habit are incompatible.

In the following key are given in square brackets several species listed by authors, apparently on the authority of Gogorza y Gonzalez and Casto de Elera; the identifications in these compilations cannot be accepted unless substantiated by competent Dutch, English, French, or German ichthyologists. I have therefore given no descriptions of these doubtful species.

Key to the species of Arius reported from the Philippines.

a^1. Teeth on the palate granular or molariform.
b^1. Teeth in four groups (*Ariodes* Bleeker).
c^1. Posterior patches in a broad oval or ellipse, converging behind or parallel.
d^1. Anterior patches well developed.
e^1. Forward patches ovate-elliptical, far apart, each of sixteen to twenty-six or more teeth, their length parallel to front margin of palate; posterior patches far back, elliptical, usually parallel; occipital process a truncate triangle with nearly straight sides; gill rakers twelve..... **A. magatensis.**
e^2. Forward patches ovate, nearly at right angles to anterior palatal margin; posterior patches pear-shaped, converging behind; occipital process triangular, elevated along the center, sides convex; gill rakers nine..... **A. crossocheilus.**
d^2. Anterior patches very small or rudimentary; occipital process with straight sides; gill rakers seven or eight.
[*A. argyropleuron.*]
c^2. Posterior patches elongate or in a narrow oval, ending at the rear in diverging points.
f^1. Occipital process ovate or oval, large, elevated, with convoluted rough surface; gill rakers eight or nine.
A. leiotetocephalus.
f^2. Occipital process triangulate, with straight sides, the surface radially granulate; gill rakers twelve..... **A. goniaspis.**
b^2. Teeth in two groups (*Pseudarius* Bleeker).
g^1. Teeth beginning at front margin of palate and covering most of its anterior surface, the patches broadest anteriorly; gill rakers twelve..... **A. manillensis.**
g^2. Teeth far back on palate in semioval patches; gill rakers fourteen ..... [*A. maculatus.*]
a^2. Teeth on the palate not granular or molariform.
h^1. Teeth on the palate strong, coarse, conical with pointed ends; two small ovate-triangulate, widely separated patches on the palatine bones; rest of palate smooth; gill rakers twelve.
A. dispar.
h^2. Teeth on the palate villiform in three groups on each side, forming a pair of subtriangular patches, their bases forward; gill rakers nine (*Netuma* Bleeker)..... **A. thalassinus.**

Arius magatensis sp. nov. Plate, 1, fig. 1.

Anal 20 or 19; pectoral 1–11.

Body elongate, slender and strongly compressed laterally on the posterior half, the depth 5.1 to 5.3 times in the length; head 3.35 to 3.6 times in the length, its dorsal profile convex from the base of the dorsal to the tip of the depressed snout, its breadth 1.45 to 1.5 times in its length and 1.4 to 1.66 times its depth; the plates on top of the head granulose, with a very

long median fontanelle beginning on the snout opposite the space between the nostrils and broadening out to beyond the eyes, then narrowing to a long triangular slit which does not extend to the occipital process; this is a truncate triangle with nearly straight sides, granulose and keeled, the base somewhat expanded; the basal bone of the dorsal spine lunate, narrow, granulose, short; the humeral process triangular, its surface granular; the projecting snout somewhat angulate and pointed centrally, 2.58 to 3 times in the head; eye elliptical, its margin free, 5.6 to 6.9 times in the head, 1.8 to 2.65 times in the snout, and 2.5 to 3 times in the interorbital; the maxillary barbel extends to the posterior margin of the head or the base of the pectoral; the mandibulary barbel 0.7 as long as the maxillary, and the mental barbel 0.45 to 0.47 as long; upper lip projecting, partially exposing the upper band of teeth, the inner margin of the lips finely rugose; the teeth in the upper jaw villiform, in a narrow arched band, its breadth 4 to 4.4 times in its length; the lunate band in the lower jaw divided at the middle by a conspicuous septum, longer than the upper band, widest at the middle and tapering to a point at the outer ends; on each side at the forward outer angle of the palate is an ovate-elliptical patch of granular teeth, sixteen to twenty-six or more in number, its long axis parallel with that of the anterior margin of the palate and equal to the diameter of the pupil; far back on the palate is a pair of somewhat elliptical patches of coarse granular teeth, their long axes either parallel or slightly converging behind and equal to or longer or shorter than the eye; the dorsal fin 1.1 to 1.2 times the depth, longer than the head without the snout, 0.71 to 0.83 of the head, its spine moderately strong, sharp-pointed, granulose anteriorly, smooth behind, 1.6 to 1.8 times in the head; the pectoral 0.66 to 0.72 of the head, its flattened spine equal to or a little shorter than the dorsal spine, its outer and inner margins varying from slightly roughened to finely but strongly serrate; the base of the adipose fin 1.75 to 2 times in that of the anal, and about 4 times (3.87 to 4.3) in the distance to the dorsal; the caudal deeply lobate, the upper lobe longest; the broad ventrals do not reach the anal, their length equal to or a little more than the base of the anal, 1.7 to 2 times in the head; gill rakers 12 + 6, the longest equal to the pupil and a little more than half the length of the gill filaments; the conspicuous lateral line begins beneath the dorsal, varying from the anterior to the posterior end of its base.

The color in alcohol is bluish to dark chocolate brown above, darkest on top of the head, the sides paler, reddish plum to whitish or yellowish below, with a silver luster all over the sides; cream color or white beneath; the fins vary from chocolate to red-brown, the caudal palest.

Here described from six specimens, 190 to 268 millimeters in length. They are part of a large number collected by me in a deep pool in Magat River at Bagabag, Nueva Vizcaya Province; owing to lack of containers I was unable to bring away more. Some of those caught were half a meter or more in length.

This species is abundant in the upper Cagayan Valley, in Cagayan River and its larger tributaries. One of the specimens caught, a male, had his mouth full of large eggs, twelve or fifteen in number, which he was incubating after the well-known maner of many Ariidæ. This was on April 28.

Arius crossocheilus Bleeker. Plate 1, fig. 2.

Arius crossocheilus BLEEKER, Arch. Ned. Ind. 3 (2) (1846) 137.
Arius crossocheilus WEBER and BEAUFORT, Fishes Indo-Austr. Arch. 2 (1913) 276, fig. 107.
Arius tonggol BLEEKER, Arch. Ned. Ind. 3 (2) (1846) 292; GÜNTHER, Cat. Fishes 5 (1864) 164; MEYER, Ann., Soc. España Hist. Nat. 14 (1885) 41.
Ariodes tonggol BLEEKER, Atlas Ichthy. 2 (1862) 39, pl. 57.

Anal 18; pectoral 1, 11.

Body elongate, the depth about 5, the head 3.5 times in the length; the head much wider than deep, its breadth about two-thirds its length; the granulated occipital process triangular, somewhat longer than its basal width, elevated mesially and less than twice as long as its width at the middle, its sides convex, the posterior margin touching the basal bone at the foot of the dorsal spine; this bone is narrow, with winglike ends, and is granulated above; on young specimens the occipital process is narrow and strongly keeled; the median fontanelle begins on the snout, ends before the occipital process, and is broadest in the middle; the dorsal profile slopes down in a straight line to the somewhat conical, rounded, slightly prominent snout; the eyes are 5 to 6 times in the head, placed about the middle of the head; the orbital margin free; in the young the eye is less than twice, in adults more than twice in the snout, and nearly 3 times in the interorbital space; the maxillary barbels extend on the pectorals in the young, in old specimens not quite to the pectoral base; the mandibulary barbels reach the hind border of

the gills, the mental barbels are shorter; both jaws have sharp villiform teeth in an arcuate band; the coarse granular palatal teeth are in four separate patches; there are two small, widely separated patches on the front of the palate and posteriorly two large, pear-shaped patches, their long axes converging behind; the anterior patches are about half the size of the eye; the height of the dorsal is more than two-thirds the length of the head; its spine nearly equal to the head without the snout, its front border granular below, serrated above and behind; the pectoral equals the dorsal, its flattened spine serrate on both margins, stronger than the dorsal spine and equal to it in length; the ventrals do not nearly reach the concave anal; the base of the small adipose fin is from 5 to more than 6 times in the distance to the dorsal; there are about nine stiff, somewhat flattened gill rakers, much shorter than the gill filaments.

The color is bluish brown above, silvery white below, the fins yellowish with more or less distinct dusky margins.

Meyer reported this species from Laguna de Bay, and it has been listed from various Philippine localities by Spanish authors. It may well occur here, but I have seen nothing approximating it among the thousands of specimens observed from Laguna de Bay and Manila Bay.

The above description is after that of Weber and Beaufort. This is a marine species, known from Java to Celebes. As it has not been reported elsewhere from fresh water I look upon the Laguna de Bay record with suspicion.

Arius leiotetocephalus Bleeker. Plate 1, fig. 3.

Arius leiotetocephalus Bleeker, Nat. & Geneesk. Arch. Ned. Ind. 3 (2) (1846) 292; Weber and Beaufort, Fishes Indo-Austr. Arch. 2 (1913) fig. 112.
Arius meyenii Müller and Troschel, Horae Ichth. 3 (1849) 9.
Ariodes leiocephalus Bleeker, Ichth. Arch. Ind. Prodr. I Siluri (1858) 88; Atlas Ichth. 2 (1862) 40, pl. 60, fig. 2.
Arius liocephalus Günther, Cat. Fishes 5 (1864) 165.

Anal 15–17; pectoral 1–12–13.

Body elongate, thick, laterally compressed, the depth 4.4 in the length (4.66 to 5.25, according to authors); the head is 3 times (3.2 to 3.66, according to authors) in the length, its breadth over a tenth more than its depth and 1.5 times in its length; the occipital process is large, ovate, elevated centrally and anteriorly, its surface rough with convoluted ridges, its breadth 1.3 times in its length, fitting closely against the narrow basal bone of the dorsal spine; the top of the head smooth, with

a long narrow median fontanelle beginning close to the occipital process and running forward upon the snout, the dorsal profile descending in a long straight incline of about 30° to the tip of the snout; the broad snout expanded laterally and upward between the eyes and nostrils, its blunt tip broadly rounded, projecting beyond the inferior mouth; the eye is 7.2 times in the head, 3.85 times in the interorbital space, its margin free; the maxillary barbels reach nearly or quite to the rear margin of the opercle; the mandibulary barbels are about two-thirds, the barbels near the tip of the chin a little more than half as long; the inner margin of the upper lip is crenate-lobulate, the lower lip covered with transverse corrugations; the teeth in the upper jaw are in a single curved band, villiform, very sharp; some distance behind are two small, widely separated oval patches, placed obliquely, and beyond these are two additional elongate patches, broad anteriorly, ending posteriorly in narrow, long-drawn-out, diverging points; the sharp villiform teeth of the lower jaw are in a narrow band, separated in two parts by a median toothless space; the humeral process smooth, triangular; the dorsal fin nearly equal to the depth, its stout spine covered with coarse granulations anteriorly, its posterior side smooth or nearly so, its length nearly two-thirds that of the head (two-thirds or three-fourths, Auctt.) ; the base of the small adipose fin is 3 times in that of the anal, about 7 times in the distance between its origin and the insertion of the dorsal; the pectoral is two-thirds the length of the head, the flattened spine equal to that of the dorsal, serrated before and behind; the caudal is deeply lobate; eight or nine short, stiff, flat gill rakers.

The color in alcohol is reddish brown with a metallic silvery sheen, the underside cream to bluish white; thickly sprinkled on the belly with minute violet-brown ocellated specks; the fins dusky yellowish.

Here described from a specimen, 284 millimeters long, collected by me in San Miguel Bay, Camarines Sur Province, Luzon, where it was being caught in large quantities in baklad. I also collected two specimens, 185 and 240 millimeters long, at Tacloban, Leyte. Professor E. C. Starks, of Stanford University, collected a specimen, 370 millimeters long, in the Manila market, in August, 1926.

A marine and estuarine species, known hitherto from Malacca and Singapore to Celebes.

Arius goniaspis Bleeker. Plate 1, fig. 4.

Arius goniaspis BLEEKER, Act. Soc. Indo-Neerl. 3 (1858) 44; GÜNTHER, Cat. Fishes 5 (1864) 166; WEBER and BEAUFORT, Fishes Indo-Austr. Arch. 2 (1913) 283.

Ariodes goniaspis BLEEKER, Ichth. Arch. Ind. Prodr. I Siluri (1858) 91; Atlas Ichth. 2 (1862) 42, pl. 60, fig. 1.

Anal 17; pectoral 1–11.

Body elongate, the depth 5.2 times, the head 3.3 times in the length; the breadth of the head 1.4 times its depth and two-thirds of its length; the profile slightly convex, depressed anteriorly, the head granulated above, the occipital process triangulate, the lateral margins nearly straight just as in Bleeker's figure, expanded basally, about as wide as long, more or less radially granulate, with a central keel, the slightly notched hind margin touching the short, granulate, curved bone before the base of the dorsal spine; the median fontanelle begins opposite the hind margin of the posterior nostril and widens to beyond the eye, then narrows and continues back to a point opposite the posterior angular tip of the preopercle; the small humeral process is sharply triangular, its surface rugose; the projecting snout is broadly rounded, depressed, convex, 2.6 times in the head; the eye is obliquely placed, elongate, with vertical pupil, 2.4 times in the snout and 2.7 times in the broad interorbital; the mouth is moderate, the upper jaw projecting so that the teeth are exposed when the mouth is closed; the sharp villiform teeth in the upper jaw are in a curved band, its length 4.5 times its breadth; the teeth in the lower jaw are in a longer band, widest centrally and tapering posteriorly, divided in two parts by a narrow symphysial interspace; the conical, coarsely granular, palatal teeth are in two groups on each side, a small ovate patch at the outer margin anteriorly, and an elongate patch posteriorly, the two latter divergent; on the left side the two patches have coalesced in my specimen to form a single, large, curved patch; the maxillary barbel reaches to the posterior extremity of the head in my specimen; the mandibulary barbel reaches almost to the base of the pectoral, 1.5 times in the length of the maxillary barbel; the mental barbel much shorter, 2.4 times in the maxillary barbel; the dorsal 1.3 times the depth and nearly 1.2 times in the head; the dorsal spine 0.9 the depth, 1.75 times in the head, its anterior margin rugose, becoming barbed near the apex, its posterior margin barbed; the adipose fin small,

its base about 4 times in the distance to the posterior end of the dorsal base, 1.75 times in the base of the anal; the pectoral 1.46 times in the head, its spine equal to that of the dorsal, with similar rugosities and toothed barbs; the ventrals short, not reaching the anal, twice in the head; the upper lobe of the deeply notched caudal is the longer; the lateral line conspicuous, its origin opposite the dorsal spine; the axillary pore moderately conspicuous; the slender gill rakers 12 + 8, the longest about 2.2 times in the eye.

The color in alcohol is chocolate brown on the head, gradually becoming paler posteriorly along the back, whitish below the lateral line, the sides of the head passing into reddish brown and whitish, all with a silvery luster, except along the median dorsal region of head and back; white beneath; the dorsal and pectorals blackish, more or less hyaline marginally; the adipose fin blackish basally or reddish brown by transmitted light, becoming clear marginally; the caudal reddish brown basally, with a silver sheen, the rays yellowish brown, becoming clear posteriorly; the anal brownish basally, clear posteriorly; the ventrals white beneath, somewhat dusky above along the outer basal region.

Here described from a specimen, 208 millimeters long, obtained by me in the Manila market and said to come from Laguna de Bay. I recently found in the Manila market a specimen, 320 millimeters long, which I refer here. In it the two palatal patches on each side have coalesced to form but one.

Previously known from two specimens, 100 and 113 millimeters long, obtained by Bleeker in Sumatra.

Arius manillensis Cuvier and Valenciennes. Plate 1, fig. 5.

Arius manillensis CUVIER and VALENCIENNES, Hist. Nat. Poiss. 15 (1840) 69.

Rita manillensis GÜNTHER, Cat. Fishes 5 (1864) 94; JORDAN and RICHARDSON, Check List Phil. Fishes (1910) 13.

Pseudarius philippinus SAUVAGE, Bull. Soc. Philomat. IV 7 (1880) 226.

? *Arius falcarius* MEYER, Ann., Soc. España Hist. Nat. 14 (1835) 41.

Anal 18, in one specimen 17; pectoral 1–10.

The elongate body laterally compressed, the posterior half much so, the depth 4.6 times, the depressed head 3.1 to 3.3 times in the length, its width about 1.4 times in its length and 1.33 to 1.48 times its depth; the plates on top of the head granulose, with a very long median fontanelle beginning on the snout opposite the posterior nostril and extending as a broad, shallow, sub-

triangulate depression beyond the eyes, then narrowing to a slit which continues nearly to the occipital process; this is subtriangular, with a widely expanded base about equal in width to the length of the process; the basal bone of the dorsal spine narrow, short, its surface granulate; the humeral process nearly triangular, smooth, or its lower margin somewhat granular; the dorsal profile describes a very gentle curve from the base of the dorsal to the tip of the strongly projecting, broad, blunt, slightly rounded snout; the eye elliptical, slightly oblique, its margin free, the ovate pupil vertical, 3 times in the interorbital, 2.5 to 2.8 times in the snout, and 6.4 to 6.72 times in the head; the maxillary barbel extends to or nearly to the posterior extremity of the head; in the young it is much longer, reaching to the middle of the pectoral; the mandibulary barbel two-thirds as long as the maxillary, the mental barbel less than half as long; the lips minutely rugose and velvety; the teeth in the upper jaw sharp, villiform, in a narrow band widest at the extremities, its greatest width 5.5 times in its length; beginning at the front margin of the palate and covering most of its anterior surface, therefore not far apart, are two large, parallel, somewhat ovate patches of blunt, rounded, coarsely granular, thickly crowded teeth, broadest near the anterior end, their length 1.7 to 1.9 times their breadth and 1.45 to 1.55 times the length of the eye; the under jaw very short, the upper band of teeth exposed when the mouth is closed; the villiform teeth of the lower jaw are in a narrower and much longer band than in the upper jaw, divided at the symphysis by a frenum which is an inward extension of the lip; the dorsal fin equal to or a little less than the depth, shorter than the head without the snout, about two-thirds of the head, its stout spine granulate-serrate before and behind; the pectoral about 1.6 times in the head, its spine a trifle longer than that of the dorsal, flattened, its outer margin feebly, its inner margin strongly serrate; the base of the adipose fin twice in that of the anal and 4.25 times in the distance to the posterior end of the dorsal; the caudal deeply lobate, the upper lobe longest or the lobes nearly equal; the ventrals extend back upon the anal to about the seventh ray, their length very slightly more than that of the pectoral; gill rakers 12 + 6, the longest one 2 in the eye; lateral line very conspicuous, beginning below the basal bone before the dorsal spine.

The color in life blackish to leaden above, passing into whitish below, with a brilliant metallic silver and golden bronze luster, the underside of head and belly cream; the fins all blackish on

both sides, all except the dorsal and adipose fin with a narrow, milk white border. In alcohol the dorsal region chocolate brown, much paler below the lateral line, the brown thinning out to cream, with a silvery metallic sheen over all; the underparts nearly white; the dorsal dusky brown, paler distally, the adipose dorsal chocolate like the back, the caudal brownish with a hyaline posterior margin; the pectorals reddish brown above, with a broad clear margin, cream white beneath; the ventrals cream white below and above, with a broad clear posterior margin and a large violet-brown patch on the upper side near the base; the anal largely yellowish brown.

Here described from two specimens, 295 and 244 millimeters long, collected in Pasig River by Mr. Thomas Carey Welch, who has for several years generously supplied me with many kinds of living fresh-water fishes. This species is very abundant in Pasig River during the spring and summer months, but is apparently less abundant or absent during the winter months. A female specimen, 235 millimeters long, contained eggs 11 millimeters in diameter on June 30, 1925; another one, 177 millimeters long, was ready to spawn on July 1, 1924.

The color is often blackish brown above, paling rapidly below the lateral line, with a bluish silvery luster over all except the underside; below the lateral line the fish may be silvery white in alcohol, the underside white or cream colored; sometimes the outer part of the adipose fin is pale, nearly colorless.

Abundant in Laguna de Bay, where large quantities are caught and shipped daily to the towns along its shores and to Manila. In the stomach and gut are found quantities of pond-snail shells. Pond snails are exceedingly abundant in Laguna de Bay and evidently form a considerable part of the food of this fish.

I have examined several hundred specimens, both living and alcoholic, from Pasig River and from Laguna de Bay, especially at Santa Cruz, Laguna Province, ranging in length down to 72 millimeters. In the young the teeth are apparently in a small patch at the outer part of each side at first; then a second patch starts about the middle of the palate, the two eventually coalescing to form a single mass.

I also have six specimens, 105 to 147 millimeters in length, from Manila Bay, at Orani, Bataan Province, and six specimens, of about the same size, from Cavite.

This species, known only from a single specimen, about 355 millimeters long, collected by Eydoux and Souleyet in Manila, was placed under the genus *Rita* by Günther, presumably be-

cause Valenciennes described it in a section of his genus *Arius* made up of Indian species now called *Rita* belonging to the family Bagridæ, in which the posterior nostril has a barbel. There is nothing in Valenciennes's description to suggest *Rita* and, needless to say, Eydoux and Souleyet never collected a *Rita* in Manila.

I place here the fish described by Sauvage, collected in Luzon by L. Laglaize. The only marked differences are anal 16, head 4 times in the length, and the patches of teeth far apart on the palate. As Sauvage's specimen was but 130 millimeters long, the masses of palatal teeth had probably not gained their full development. He does not say whether he included the caudal fin in the length or not; the anterior anal spines are very small and difficult to make out and they were probably overlooked. I have many specimens with teeth as described by Sauvage, but numerous other specimens link them with what I regard as typical *Arius manillensis.*

I have no doubt that the specimens collected at Santa Cruz from Laguna de Bay by Dr. A. B. Meyer in 1872, and listed by him as *A. falcarius,* and the specimens listed under the same name by the Spanish writers are really *A. manillensis.*

Arius dispar sp. nov. Plate 1, fig. 6.

Anal 18; pectoral 1–11.

Body elongate, the posterior half much compressed laterally, the depth 5.34 times in the length; the head 3.22 times in the length, its breadth two-thirds of its length and 1.5 times its depth; the dorsal profile gently convex, the snout broadly rounded; the plates on top of the head granulose, with a broad median fontanelle beginning opposite the posterior nostril and narrowing some distance beyond the eyes to a slit which continues almost to the occipital process; the latter bluntly triangulate, the sides slightly bowed, densely granulate, its blunt posterior margin in contact with the narrow, crescentic, granulose bone at the base of the dorsal spine; the humeral process small, sharply triangulate, smooth; the snout projects beyond the lower lip but the upper teeth are not exposed; the eye rather high up, 7.3 times in the head, 2.65 times in the snout, and 3.2 times in the interorbital; the sharp villiform teeth of the upper jaw are in a slightly curved band, widest at the ends, its breadth 5 times in its length; the slightly longer and much narrower crescentic band of similar teeth in the lower jaw is divided at the middle by a narrow toothless space, broadest centrally and

very narrow at the ends; on the palatine bones are two small, very widely separated, ovate-triangulate patches of strong coarse conical teeth, their pointed ends converging forward, the long axis 2.5 times in the eye, the width of their base three-fourths of the length; the rest of the palate is perfectly smooth; the maxillary barbel extends to the base of the pectoral; the mandibulary barbel extends to the gill opening and is 1.27 times in the length of the mandibulary barbel; the mental barbel is much shorter, about 1.75 times in the length of the mandibulary barbel; the dorsal fin 1.3 times in the head, its spine 1.73 times in the head, its anterior margin granulose, becoming serrate near the tip, and serrate behind; the pectoral is 1.4 times in the head, its flattened spine smooth on its basal half, serrate on the upper half on both margins, $1\frac{2}{3}$ times in the head, slightly longer than the dorsal spine; the ventrals extend to the fifth or sixth anal ray, their length $1\frac{2}{3}$ times in that of the head; the caudal is deeply notched, the upper lobe longest, 3 times the length of the middle rays; the base of the adipose fin is 1.76 times in that of the anal, 3.7 times in the distance to the dorsal; gill rakers stiff, laterally somewhat flattened, $12 + 7$, all elongate, the longest one twice in an eye diameter; the lateral line conspicuous, its origin beneath that of the dorsal; an axillary pore present.

The color in alcohol blackish brown above with a metallic sheen on the sides, passing into bright silvery below the lateral line, the lower and under part of the trunk and underside of the head white; the dorsal blackish, the lower half of the adipose dorsal deep red-brown by transmitted light, blackish brown when viewed directly; the upper side of the pectoral dusky, its underside and both sides of the ventrals white; the caudal pale brown, clear posteriorly.

Here described from a specimen, 235 millimeters long, from Paco market, Manila. I also have a specimen, 232 millimeters long, from Laguna de Bay and one, 225 millimeters long, from Pasig River; in these the base of the adipose fin is almost 4 times in the distance to the dorsal. Another specimen, 200 millimeters long, from the Quiapo market, Manila, has twenty anal rays and cylindrical gill rakers, but is otherwise sufficiently like the type to be placed here. Professor E. C. Starks, of Stanford University, obtained a very fine specimen, 340 millimeters long, at Los Baños, Laguna Province. Its elongate snout and thick lips make this species noticeable when seen among the common catfishes of Laguna de Bay.

I can find no similar fish described in the literature, the teeth and gill rakers separating it at once from anything described by Bleeker, Günther, Day, Vaillant, Sauvage, or Weber and Beaufort.

This fish is very abundant in the esteros in the City of Manila. In November, 1925, thousands were killed by the excessive multiplication of some flagellate protozoan in the water of esteros, and the consequent coating of the fishes' gills.

Arius thalassinus (Rüppell). Plate 1, fig. 7.

Bagrus thalassinus RÜPPELL, Neue Wirbelt., Fische (1835) 75.
Arius nasutus (CUVIER and VALENCIENNES), Hist. Nat. Poiss. 15 (1840) 45.
Netuma thalassina BLEEKER, Atlas Ichth. 2 (1862) 28, pl. 61.
Arius thalassinus GÜNTHER, Cat. Fishes 5 (1864) 139; DAY, Fishes of India (1878) 463, pl. 104, fig. 4, and pl. 106, fig. 1; WEBER and BEAUFORT, Fishes Indo-Austr. Arch. 2 (1913) 287, figs. 106 and 114.

Anal 15 to 18; pectoral 1–11 to 13.

The robust, elongate body varies considerably in height, the young being deeper, the depth 4.5 to 5 times in the length, only the caudal peduncle much compressed laterally; the head 3.2 to 3.6 times in the length, its breadth 1.3 to 1.5 times in its length and 1.66 to 1.8 times its depth; in large specimens the dorsal profile is a little convex from the base of the dorsal to a little behind the eyes, then a trifle concave, convex again from the nostrils to the tip; in others the profile is more or less slightly convex to nearly straight; the plates on top of the head are more or less granulose, thickly so in large specimens, with a median fontanelle beginning near the tip of the snout, broadening rapidly, widest above the eyes, then narrowing rapidly to a long slit which extends to or nearly to the occipital process; this is more or less triangular, with straight to convex sides, elevated and with a median keel which is less evident to rounded in large specimens, densely covered with rather small granules, much longer than broad, its posterior margin truncate to convex but never notched, touching the rather narrow, curved or crescent-shaped, coarsely rugose bone at the base of the dorsal spine; the humeral process large, triangular, its surface covered with raised wavy lines; the broad snout bluntly rounded to pointed in old specimens, projecting beyond the lower jaw, the upper band of teeth exposed, 2.45 to 2.6 times in the head; a prominent, laterally projecting bone before each eye; the eye is somewhat obliquely placed, with a free margin, the broadly ovate pupil vertical, 2.1 to 2.5 times in the snout, 5.7 to 6.3 times in

the head and 3 to 3.2 times in the interorbital; the maxillary barbel reaches to the base of the pectoral in smaller specimens, but in large ones not much beyond the rear margin of the preopercle; the mandibulary barbel is a little more than half as long, the mental barbel about a third of the maxillary barbel; the sharp villiform teeth of the upper jaw are in a curved band, its length 6 to 6.5 times its breadth; the similar teeth of the lower jaw are in a longer, narrower, semilunar band, divided at the middle by a conspicuous septum, broadest centrally, very narrow at the ends; at the front margin of the palate are four united patches of villiform teeth forming a curved crossband; behind this on each side is a large, roughly triangulate patch of villiform teeth which usually touches the basal patches but may be more or less separated by a toothless strip; the dorsal fin 3.6 to 3.9 times in the length, a little shorter than the head, the sharp spine granulose in front, the upper part serrated behind, 1.2 to 1.3 times in the head; the pectoral 1.4 to 1.6 times in the length, its flattened spine coarsely granulose in front, serrated behind, a little shorter than the dorsal spine; the ventrals do not reach the anal in our specimens, and are much less than the dorsal, 1.8 to 1.9 in the dorsal, 2 to 2.2 times in the head; Weber and Beaufort say "ventrals reaching on anal, their length equal to height of dorsal," but I do not find them so in Philippine material at hand; the base of the adipose fin 3.1 to 3.5 times in the base of the anal, 9.66 to 10 times in the distance to the dorsal; the caudal deeply notched, the lobes pointed, the upper one longest and 3.3 times the middle rays; gill rakers 9 + 5, stiff, subcylindrical, the longest less than half an eye diameter.

Color reddish to bluish brown, darkest above, paling low down on the sides, with a silvery luster, the underside whitish; the fins are more or less dusky, the underside of the pectorals and ventrals more or less white; the caudal paler than the other fins; the upper half of the adipose fin black.

Here described from several specimens, 260 to 350 millimeters in length, from Manila Bay and from Bulan, Sorsogon Province. This is the most abundant and most important Philippine catfish; it is caught in large quantities in fish traps in shallow bays and estuaries and in Laguna de Bay. Specimens from half to three-fourths of a meter in length are common in the Manila markets.

I place here a specimen, 270 millimeters long, from Manila Bay, which has but two patches of teeth on each side of the palate; it is probable that the two anterior transverse patches on each side have become completely united, leaving no trace of any dividing line or point of junction; in other respects it does not differ markedly from ordinary *A. thalassinus;* the underside is white, with several large patches of minute violet-brown specks; base of adipose fin 9 times in distance to dorsal. Study of a large series shows that the patches of palatal teeth may fuse so that there are but two patches on each side, each roughly triangular, the two basal patches fused with the posterior one, but all showing more or less distinctly their original separation.

The Bureau of Science collection also contains two specimens, each about 165 millimeters long, from Culion.

This is a widely distributed species, ranging from the Red Sea and Zanzibar to North Australia and the coast of Cochin China.

Genus **HEMIPIMELODUS** Bleeker

Hemipimelodus BLEEKER, Ichth. Arch. Ind. Prodr. I Siluri (1858) 236.

Body elongate, laterally compressed posteriorly, the head more or less depressed; the transverse mouth moderate to small, with prominent or projecting snout; the jaws each with a band of villiform teeth, the palate toothless; the head plates are more or less granulate to rugose, exposed or covered with skin, the occipital process keeled or winged, granulate or roughened, posteriorly touching the basal bone of the dorsal spine; the maxillary, mandibulary, and chin barbels long and slender; the nostrils close together, without a barbel; the eyes may or may not have a free margin; the dorsal has a pointed spine and seven rays, its origin halfway between the ventrals and pectorals or nearer the latter; the pectorals also have a sharp spine; the ventrals have six rays, the anal fifteen to twenty; the adipose fin is moderate or short, its origin above or slightly before the anal; the caudal deeply forked; an axillary pore is present; the gill membranes united, attached to the isthmus along the median line, leaving a narrow margin free; gill rakers in moderate number; branchiostegals five or six.

A small genus of East Indian catfishes, apparently confined to fresh water, with one species in the Philippines.

Hemipimelodus manillensis (Cuvier and Valenciennes).

Pimelodus manillensis CUVIER and VALENCIENNES, Hist. Nat. Poiss. 15 (1840) 142.

Hemipimelodus manillensis JORDAN and RICHARDSON, Check List Phil. Fishes (1910) 13.

Anal 18 to 20; pectoral 1–10.

Body elongate, slender, the posterior third compressed, the caudal peduncle strongly so, the depth 5.1 to 5.9 times in the length; the dorsal profile of the head slightly convex, the head much depressed before the eyes, 3 to 3⅓ times in the length, its breadth about 1.5 times in its length and 1.5 to 1.6 times its depth; the head finely granulate above, the occipital process keeled, thickly covered with small granules, much longer than broad, the sides sinuous, notched at the apex, the basal bone of the dorsal spine short, curved, narrow, granulose; the median fontanelle is very long, beginning on the snout between the nostrils, broadening to beyond the eyes, then narrowing rapidly to a slit which extends nearly to the occipital process; the projecting snout broadly rounded, 2.8 times in the head; eyes lateral, placed obliquely, with free orbital margin, 6.4 to 7.2 in the head, 2.3 to 2.5 times in the snout, and about 3 times in the interorbital; the maxillary barbel reaches or nearly reaches the posterior margin of the head, the mandibulary about 0.7 as long, reaching the gill opening or beyond, the mental much shorter, scarcely 0.4 of the maxillary barbel; the mouth rather small, 2.8 times in the length of the head, the lower jaw shorter than the upper but the upper band of teeth not exposed; the villiform teeth of the upper jaw are in a narrow curved band, broadest at the ends, the length about 6 times its width; the teeth of the lower jaw are in a narrower and longer band, divided into two parts by a median septum, widest at the middle and tapering to a point at the outer ends; the dorsal 1.3 to 1.4 times in the head; the front margin of the flattened dorsal spine granulose below, becoming serrate near the tip, its posterior margin serrate on the upper two-thirds, the remainder smooth, its length 1.75 to 1.9 times in the head; the pectoral equals or nearly equals the head without the snout, 1.55 to 1.62 times in the head, its spine like that of the dorsal and equal to it in length; the base of the adipose fin is 1.8 to 2 times in that of the dorsal, 2.2 to 2.7 times in that of the anal, and 4.5 times in the distance to the dorsal; the ventrals reach or nearly reach the anal; the caudal deeply lobed, the lobes acutely pointed, the upper one the longer, 3.3 to 3.6 times the median rays; an axillary pore present; gill rakers

long, slender, laterally flattened, 12 + 6, two-thirds or a trifle more of an eye diameter in length.

The color in alcohol varies from blackish to chocolate brown above to bluish brown or light brown on the sides, with a silver luster, becoming yellowish white beneath; the dorsal blackish, the adipose fin with a blackish or chocolate brown spot; the caudal brown, with a clear posterior margin; the upper surface of the pectoral blackish brown, its underside pale; the ventrals and anal more or less brownish.

Here described from two specimens, 212 and 220 millimeters in length, from Laguna de Bay. I also have two fine specimens, 230 and 260 millimeters in length, obtained by me from the Manila market.

Eydoux and Souleyet collected at Manila a fish, 140 millimeters long, which was very imperfectly described by Valenciennes. There is no doubt that my specimens represent the same species.

ILLUSTRATION

PLATE 1

[All figures, except fig. 2, drawn by Marcelino Nievera.]

FIG. 1. *Arius magatensis* sp. nov.; teeth of upper jaw and palate, × 1½.
2. *Arius crossocheilus* Bleeker; teeth of upper jaw, ×⅔. (After Weber and Beaufort.)
3. *Arius leiotetocephalus* Bleeker, × 1½.
4. *Arius goniaspis* Bleeker, × ⅔.
5. *Arius manillensis* Cuvier and Valenciennes. Stages of development of palatal teeth, × 1½; *a*, mature; *b*, *c*, *d*, stages of development.
6. *Arius dispar* sp. nov.; teeth of the upper jaw, × 1½.
7. *Arius thalassinus* (Rüppell); teeth, showing variations; × ⅔.

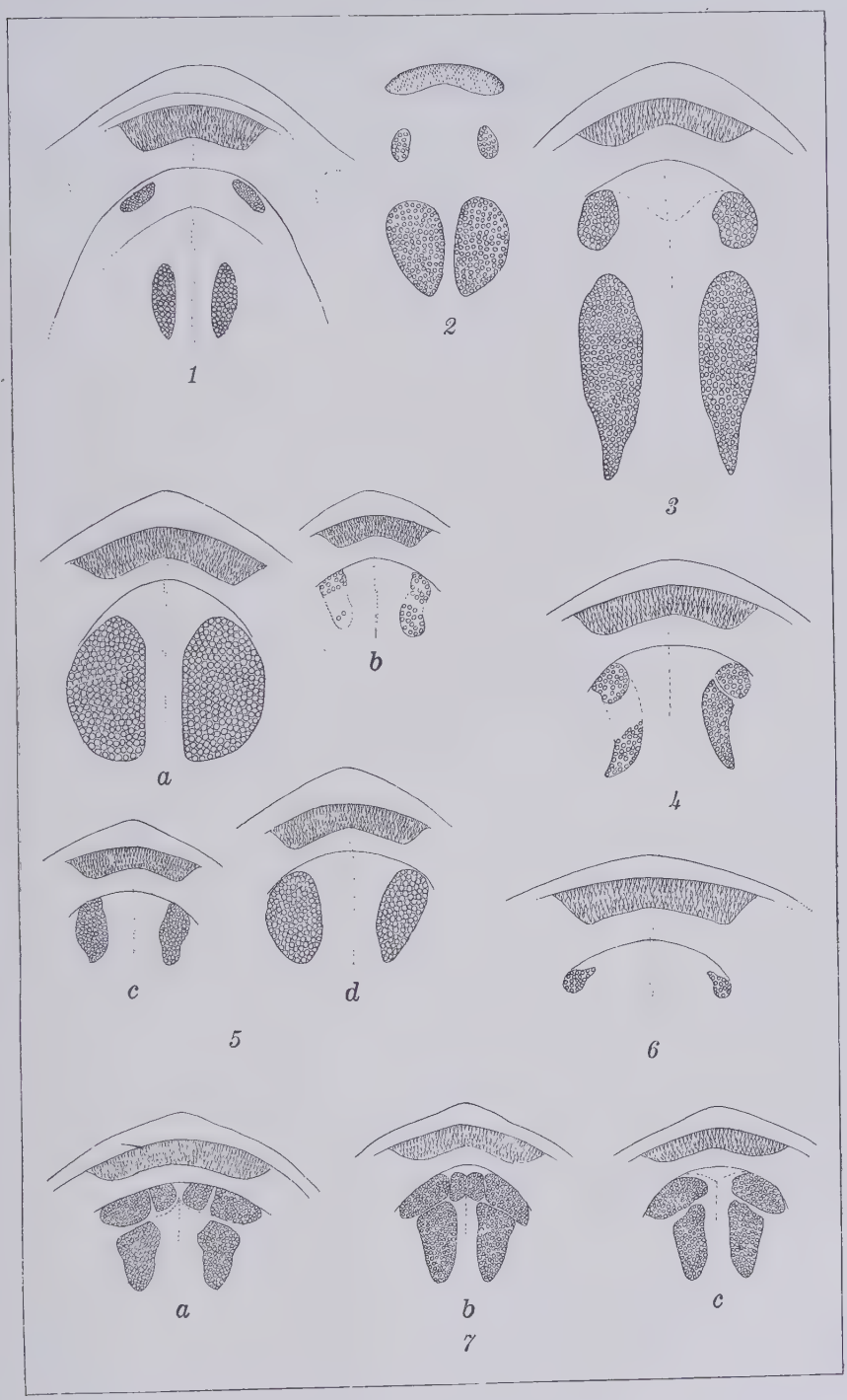

PLATE 1.

HISTOLOGICAL STUDY OF THE BARK OF ALSTONIA SCHOLARIS R. BROWN FROM THE PHILIPPINES

By José K. Santos

Of the Department of Botany, University of the Philippines, and the Bureau of Science

SIX PLATES

Dita is the name given by the Filipinos to the plant known botanically as *Alstonia scholaris* R. Brown (*Echites scholaris* Linné), an elegant forest tree, 15 to 25 meters high, belonging to the natural order Apocynaceæ. It is widely distributed and very abundant in the Philippines. It is found also from the sub-Himalayan region to Ceylon and Burma, in Java, Timor, and eastern Australia, and in tropical Africa.

A decoction, or infusion, of dita bark has long been used by the people of the Philippines as a remedy for various febrile ailments and for chronic diarrhœa and dysentery. In India also it is used for the treatment of the symptoms mentioned and, besides, as a tonic, an anthelmintic, and an antiperiodic. The drug was classified in the Pharmacopœia of India as one of the standard drugs. An account of the history, uses, and chemical constituents of dita bark is given by Dymock(4) and by Flückiger and Hambury.(5) Among the prominent workers cited by them is Gruppe(8) who was the first to isolate (in 1874) an uncrystallizable, highly hygroscopic, bitter substance which he said possessed febrifugal properties and which he presumed to be alkaloid and named ditaïn. Gorup-Besanez(6) extracted from ditaïn in 1875 a crystallizable substance but, because of lack of material, he was unable to complete the work.

Jobst and Hesse(9) conducted in 1875 a series of very thorough and interesting experiments upon the chemical constituents of dita bark. They isolated and described six definite compounds; namely, ditamin, echicaoutchin, echicerin, echitin, echitein, and echiretin.

In 1906, Bacon(1) published the results of interesting chemical, biochemical, and physiological experiments on the active

principles of dita bark. He was able to isolate a fairly good amount of ditamine and echitamine (or echitamonium hydroxide, as it is called by Jobst and Hesse). He found the physiological behavior of dita to be not at all like that of quinine.

While the physiological actions and uses and the active principles of dita have received considerable attention, yet I have failed to find a detailed pharmacognostical study of the macroscopical and microscopical characteristics of the bark upon which the identification of the drug can be based.

Materials and method.—Fresh and commercial dried barks were used in the present study. The fresh material was collected by Maximo Ramos, collector of the Bureau of Science, from a large tree in Antipolo, Rizal Province, and the dried bark was bought in Binondo, Manila, of a retail dealer in some of the Philippine medicinal plants.

The bark of *Alstonia scholaris* is very difficult material to section, especially when it is dried. This is due largely to the presence of an immense quantity of large stone cells, which in groups appear to the naked eye as yellow granules embedded in delicate, thin-walled, parenchymatous tissue, and partly to large quantities of calcium oxalate crystals. The presence of the remarkable, large stone cells and the abundant calcium oxalate crystals make the bark hard, brittle, and granular in texture.

Free-hand sections from fresh material were used, and these were prepared by means of a sliding microtome. Transverse, radial, and tangential sections, about 35 to 60 μ thick, were cut from the fresh bark. Some of the sections were stained with safranin and contrasted with Delafield's hæmatoxylin, and examined under the microscope in a temporary mount in dilute glycerine. The other sections were studied carefully, unstained, in chloral hydrate solution, and these proved to be more satisfactory than the stained ones. This was owing to the opacity of thick stained sections. However, the stained sections brought out certain details not observed in the unstained ones. The characteristics of the individual cells were studied in material macerated by Schulze's method as described by Greenish.(7)

The laticiferous vessels were isolated and carefully examined by means of the potash-maceration process employed by Greenish,(7) using a 2 per cent solution of potassium hydroxide. The latex tubes were treated with a dilute solution of iodine in potassium iodide before examination under the microscope. This solution imparts a yellow color to the laticiferous vessels and makes them more conspicuous than the surrounding tissues.

Description of fresh dita bark.—The bark from the trunk when fresh is 8 to 10 millimeters thick, and externally is grayish to brownish or sometimes purplish brown to green sepia, especially in places where it is covered by pleurococcus. The outer surface is uneven, rough, with many rounded or transversally elongated whitish brown lenticels, sometimes covered with corky pustules, lichens, and longitudinally and transversally cracked or fissured (Plate 1, fig. 5). The outer layer of the cork is easily separable. The inner bark is granular, due to the groups of stone cells, which are yellow and are easily removed from the soft parenchymatous tissue in which they are embedded. It is readily fractured by bending and, when bent or cut, it exudes an abundant, milky white latex which has an intensely bitter taste. The inner surface is creamy white, smooth, light, and soft. When exposed to sunlight it gradually becomes dark or brownish. Figure 5 of Plate 1 represents two pieces of fresh bark taken from different parts of a large trunk of *Alstonia* in Antipolo. When dried under shade it shrinks by about one-third of its thickness.

Commercial dita bark.—The drug is obtained in the market as a mixture of cut and broken irregular pieces, from 6 to 15 centimeters long, 5 to 8 centimeters wide, and 3 to 7 millimeters thick. The bark obtained from the branches, as indicated in Plate 2, fig. 7, usually is thinner and is curved, whereas that from the trunk is thicker and is generally flat or slightly curved, as represented in Plate 2, fig. 6. The outer surface, like that of the fresh bark, is very rough and uneven with numerous rounded or transversally elongated, gray to whitish brown lenticels, and sometimes with a few patches of lichens. The color varies from dark gray to brownish, sometimes with black spots. The external layer is much fissured longitudinally as well as transversally, particularly when the bark is derived from the old trunk and, because of these fissures, the outer layer appears scaly. This outer layer readily separates when handled, in bark prepared from the trunk, but not in bark obtained from the branches. The fracture is short, brittle, and uneven. The fracture surface is granular and spongy in texture. The bark is readily pulverizable. The inner surface is of a sepia color, fibrous in structure, and somewhat striate and indentate. The indentation is due to shrinkage of the bark other than that in the medullary rays, in which the shrinkage is small. The rays, therefore, produce slight elevations over the inner surface. The bark has little or no odor, but is persistently bitter.

Microscopical structure.—In *Alstonia scholaris* it was observed that the formation of the periderm is due to the activity of the subepidermal cells which become meristematic and form the initial phellogen layer (Plate 3, figs. 11 and 12). The first indication of the process is the slight radial elongation of these cells. The daughter cells resulting from the first tangential division differentiate into cork cells toward the epidermis, and those toward the inner side remain meristematic, as shown in Plate 3, fig. 12. In the second tangential division the cells formed toward the epidermis give rise to a phellogen layer, and those toward the inner side into phelloderm, as shown in Plate 3, figs. 13 and 14. By repeated division of the phellogen cells, radial rows of cells toward the exterior and interior parts of the bark are formed. The cells formed toward the exterior are more numerous than are those toward the interior, and they lose their protoplasm and become slightly suberized, thus forming the cork region. Those on the inner side of the phellogen, which form the phelloderm, retain their protoplasm and sometimes have chloroplastids (Plate 3, fig. 15). The phellogen layer, after a certain period of activity, ceases to divide and is replaced by secondary phellogenetic cells formed in the underlying tissue.

For convenience, the cross section of the old bark of *Alstonia scholaris* may be divided into, say, three distinct regions (the term bark is used to include everything outside the cambium). These regions are the peridermal region, the stone-cell region including a portion of the young bast, and the young-bast region. These three regions are shown in Plate 3, fig. 16, which represents a diagrammatic cross section of the bark drawn under an objective 48 millimeters and ocular $\times$ 2.

The periderm in *Alstonia* is thin and usually about one-tenth of the thickness of the entire bark. The outer part consists of ten to twenty layers of thin-walled, slightly suberized, sometimes radially elongated and radially arranged cork cells. Interior to the phellogen is the phelloderm consisting of a few layers of cells which are somewhat tangentially elongated and radially arranged. Intermingled with the cork cells are short, sclerenchymatous cells, either isolated or in groups. They appear more or less cubical, and sometimes radially or longitudinally elongated, and have thick and pitted walls. Microchemical test proved that they are lignified. According to De Bary,(3) cells of these types are genetically equivalent to the cork cells and

assume the properties of short, sclerenchymatous elements and resemble in all important points the so-called stone cells. They measure from 0.036 to 0.05 millimeter in width, 0.022 to 0.036 millimeter in thickness, and 0.036 to 0.054 millimeter in length. Sometimes they are rounded in cross section. Plate 3, fig. 17, is a detailed representation of the secondary peridermal region.

The stone-cell region occupies more than two-thirds of the thickness of the bark. It comprises the area from the phelloderm region to the young-bast region where stone cells are wanting. It is built up largely of parenchymatous cells with very thin walls, somewhat tangentially elongated or sometimes polygonal or rounded in outline. Some of them contain prismatic and rhomboid crystals of calcium oxalate. Throughout this region enormous, hard, thick-walled, sclerenchymatous stone cells are scattered in great numbers. They form large, irregular groups of a bright yellow color, and are visible to the naked eye. The outline of the individual cells in the cross and longitudinal sections is very irregular; sometimes they are pointed and their cavities are greatly reduced. Their walls are stratified, very much thickened, lignified to stony hardiness, perforated by numerous, usually branched, pit canals of circular appearance in transverse section. Toward the outer part of this region, the stone cells have thinner walls and larger cavities, and are more or less regular in outline than are those of the middle part. They are somewhat radially elongated and radially arranged, as represented in Plate 3, fig. 18. In the middle part of the stone-cell region, the stone cells have a very irregular outline and smaller cavities, sometimes pointed. They measure from 0.045 to 0.3 millimeter in diameter, and from 0.075 to 0.45 millimeter in length. Between the groups of sclerenchyma, or stone, cells there are some pith rays which are characterized by their wavy appearance, as indicated in Plate 3, figs. 19 and 20. Occasionally, between the pith rays and mixed with the phloëm of the stone-cell region, there are a few laticiferous vessels, which contain brownish, granular, latex substances. A detailed study of these vessels is given below.

In the inner part of the stone-cell region, the stone cells are very much reduced in size and are mixed with some bast fibers which measure from 0.06 to 0.15 millimeter in diameter and from 0.45 to 1 millimeter in length, with phloëm cells and phloëm parenchyma. The laticiferous vessels become more numerous, as indicated in Plate 3, figs. 19 and 20.

The third region is the bast proper, which occupies about one-fourth of the entire thickness of the cross section of the bark. It consists mostly of phloëm and phloëm-parenchyma cells, traversed by numerous pith rays and with many latex tubes. Most of the phloëm-parenchyma cells contain abundant prismatic and rhomboid calcium oxalate crystals. In the longitudinal section these crystals are found generally in rows, forming crystal fibers about 0.35 millimeter long. Plate 4, fig. 21, shows a cross section from the innermost part of the bark, and figs. 23 and 24, Plate 4, show radial sections from the inner phloëm and the inner part of the stone-cell region. The medullary or pith-ray cells have thin walls and in some parts are filled with small, ovoid or somewhat rounded starch grains. The starch grains measure from 0.0072 to 0.015 millimeter in diameter and are sometimes found in rows or in groups of three. They are not prominently striated and the hilum is not very distinct. The calcium oxalate crystals are also found rather abundantly among the pith rays. Figures 8 and 10, Plate 2, are microphotographs showing the abundant prismatic or rhomboid calcium oxalate crystals and the position of the latex tubes. Figure 25, Plate 4, is a crystal fiber, measuring about 0.34 millimeter in length and containing prismatic and more or less cubical types of calcium oxalate crystals. The sieve tubes in cross section have a more or less polygonal outline with very thin walls and sieve plates with somewhat rounded pores. These sieve plates appear regular in transverse position or slightly inclined, but in many cases a series of plates is found on the sides of the tubes, as shown in Plate 4, fig. 24. Their diameter is from 0.018 to 0.025 millimeter, and the length of the tube is about 1.8 millimeters. Developed bast fibers are not found in the youngest phloëm.

In the bark of branches that are several years old and in the material bought in the market (shown in Plate 2, fig. 7) characteristic sclerenchyma fibers are found in the pericycle. They are easily distinguished by their white color and their stratification. In the longitudinal section or in the macerated materials these fibers appear constricted at intervals to a small diameter and then abruptly much enlarged, as indicated in Plate 4, figs. 26, 27, and 28, the last-mentioned figure taken from fresh bark of a stem about 1 inch in diameter. According to Solereder,(11) this is a case of local secondary enlargement of the bast fibers accompanied by an encystment of the protoplasm in the widened portion of the fiber by means of the formation

of caps of cellulose. The enlarged part, or bulb portion, varies in length from 0.06 to 0.51 millimeter and from 0.05 to 0.15 millimeter in diameter.

Macerated form of the bark.—The material macerated by Schulze's method allows a better view of the individual cells. The varied shapes of the stone cells can be easily distinguished. They appear isolated in most cases, but occasionally they may be found in groups (Plate 6, figs. 39, 40, and 41). They are very irregular in shape and size, from a more or less rounded form to somewhat triangular or rod-shaped, and in some cases they are pointed at one end. The laticiferous vessels are observed in a fragmentary form. The medullary ray and parenchyma cells are found isolated from one another or in groups. The calcium oxalate crystals are very scanty in this sort of preparation. The characteristics of the stone cells found in the dried materials bought in the market agree well with the characteristics of those observed in the fresh material collected at Antipolo, Rizal, as shown in Plate 6, figs. 39, 40, and 41.

The potash maceration is very valuable in the examination of the laticiferous vessels, calcium oxalate crystals, sclerenchymatous tissue, bast fibers, etc. When proper consistency is obtained in this process, the tissues are easily teased out and the latex tubes are rather prominent. Their contents are very well preserved. Under the dissecting microscope they appear as white, somewhat interlacing threads, and under the compound microscope as long tubes placed parallel to each other, with brownish granular content. The walls of the parenchyma cells and the phloëm cells have a tendency to be disintegrated, and generally appear transparent and not well defined under the microscope when the sections are mounted in dilute glycerine or in chloral hydrate solution. Figures 8 and 10, Plate 2, are microphotographs from potash-macerated sections of the young phloëm region in which the latex tubes and the enormous quantity of monoclinic or prismatic calcium oxalate crystals are observed.

To get general information about the structure of the individual cells of the bark, excluding the latex tubes, perhaps the material can be best examined in powdered form. The stone cells or sclerenchymatous tissue, the calcium oxalate crystals, the medullary rays with starch grains in them, and the parenchyma cells are found in somewhat isolated form.

The laticiferous tubes. A full account of the history of the latex is given by De Bary.(3) As a result of the numerous

cases carefully investigated, the latex tubes were classified according to their form and development into (*a*) articulated tubes, which arise from a series of elongated cells of the cambium, whose walls coalesce and become perforated or disappear, forming a continuous tube; the laticiferous tubes formed in this way are characterized by their netlike anastomosing structure; and (*b*) nonarticulated laticiferous tubes, which do not exhibit netlike anastomotic characteristics, and all of the branches of which (often very numerous) end blind. According to Solereder(11) laticiferous tubes of this type are generally distributed among the Apocynaceæ and, in the majority of the species that have been investigated, are already present in the embryo. Chauveaud,(2) who made very elaborate studies of the embryonal development of the laticiferous vessels of the Euphorbiaceæ, states that their initial cells arise in the place that coincides with the node of the cotyledons. From this part they appear in the peripheral part of the central cylinder, and are separated from one another by one or a few cells.

Casual statements and quotations by Flückiger and Hambury(5) and by Dymock(4) indicate that the laticiferous tubes in *Alstonia scholaris* are formed from series of ordinary cells by the destruction or disappearance of their cross walls to form continuous tubes. Lanessan,(10) in translating the work of Flückiger and Hambury into French, added in the description that they frequently appear in an anastomosing condition. My findings, however, are quite different. In the examination of the old bark, macerated with 2 per cent of potash, the laticiferous vessels appear as continuous and independent tubes of about 0.045 millimeter in diameter, branching occasionally and running more or less parallel through the inner part of the stone-cell region, and particularly through the inner part of the bark. They exhibit granular contents from 1 to 2 μ in diameter, and have exceedingly thin walls. I was unable to observe a place where the latex tubes anastomose or the slightest indication that they are formed by partial or complete destruction of the cross walls of a series of ordinary cells. The tubes appear uninterruptedly continuous throughout the plant. No trace of articulations was noticed among the many sections examined. Figures 30 and 31, Plate 5, illustrate beautifully the characteristic arrangement and the types of laticiferous tubes in old bark, about 10 centimeters thick, macerated with caustic potash. They are more or less straight and arranged almost parallel to

each other, particularly those found in the region of the young phloëm, as indicated in Plate 5, fig. 30, a tangential view of a group of latex tubes obtained from the bast region, in which one of them has a branch. In Plate 5, fig. 31, on the other hand, the tubes are slightly wavy or crooked, due to the fact that they are from the outer part of the young phloëm, where stone cells and ordinary sclerenchyma cells are found.

The relation of the tubes in the longitudinal sections with the other types of tissue where they occur in the bark is indicated in Plate 4, figs. 22, 23, and 24; fig. 22 is taken from the outer part of the young phloëm, showing the relation of a latex tube with the parenchyma, stone, and pith-ray cells; fig. 23, toward the young phloëm where the stone cells gradually disappear; and fig. 24 is from a radial section through the young phloëm and shows very well the parallel arrangement of the tubes and their relation with the phloëm. It is interesting to note, however, that occasionally the latex tubes are found in the pith rays, and this is due to the lateral branching of the vertical tubes.

The parallel arrangement of the latex tubes is more or less indicated in the photomicrographs figs. 8 and 10, Plate 2, although these were taken purposely to show the distribution and abundance of the calcium oxalate crystals. The sections were macerated in caustic potash and stained with iodine solution, so the phloëm and the phloëm parenchyma cells are not clearly seen.

The most significant evidence that the latex tubes in *Alstonia scholaris* are not formed by the destruction of the cross walls of certain series of ordinary cells in the young phloëm was obtained from a critical investigation made on the tips of very young stems. However, I regret having been unable to secure fresh seeds for the study of the embryonal stages of these latex tubes. Nevertheless, with the important facts obtained from the detailed examination of the macerated sections of the tips of the very young stem, it is safe to state here that the tubes are formed by growth and not by fusion of cells. The tubes possess all the morphological characteristics of the nonarticulated tubes. They are more or less dichotomously branched, as indicated in Plate 5, figs. 32, 36, and 37, showing laticiferous vessels dissected carefully from the macerated sections of the tips of young stems. The branching occurs especially in the region of the nodes. The branches may arise at an acute or obtuse angle from the tubes and grow in an upward direction, or at a right angle and grow

toward the outer side or toward the lower part of the stem, as shown in the figures (and particularly in fig. 34, which was taken from a macerated section of the bark of a two- to three-year-old branch). The branches make their way through the intercellular spaces in the young phloëm and parenchyma cells. Their diameter is considerably smaller, as compared with that of the surrounding cells (which may indicate that they are not derived from them), and it gradually decreases toward the tip, as represented in Plate 5, figs. 35 and 38. The terminal part of the branch is somewhat wavy or spirally twisted like a screw and with a somewhat pointed tip (Plate 5, fig. 38). Figure 9, Plate 2, is a photomicrograph taken from a macerated section of a stem tip, and shows also the method of branching of the tubes.

In the petiole and midrib of the leaves, the latex tubes occur on the peripheral side of the phloëm region, and sometimes mixed with the phloëm cells. They are arranged parallel and close together as shown in Plate 5, fig. 33, prepared from a macerated section of a portion of the midrib of a nearly mature leaf. Those at the sides of the midrib send out branches which pass through the veins of the leaves. Thus, if the surface of the leaf is injured, a milky fluid is also exuded.

SUMMARY

The chief microscopical diagnostic characteristics of dita bark are the following:

1. The thin-walled, closely fitted, slightly suberized, brownish cork cells.
2. The short, sclerenchymatous cells in the cork region, which have a more or less cubical form.
3. The remarkable stone cells with very much thickened walls, stratified, lignified to stony hardness, perforated by numerous, usually branched, pit canals.
4. The wavy pith-ray cells, containing numerous, small, spherical, often compound starch grains.
5. The calcium oxalate crystals in prismatic, rhomboid, or monoclinic forms, frequently in crystal fibers.
6. The nonarticulated laticiferous tubes, which branch occasionally.
7. The series of sieve plates arranged on the sides of the sieve tubes.

8. In the bark from the branches, the characteristic fibers which are constricted at intervals to a small diameter and then abruptly much enlarged.

ACKNOWLEDGMENTS

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ILLUSTRATIONS

[All drawings by the author. The photographs were prepared by the photographer of the Bureau of Science, except fig. 7, which was prepared by the Department of Botany, University of the Philippines.]

PLATE 1. ALSTONIA SCHOLARIS R. BROWN

FIG. 1. A habit sketch of a small part of a branch, showing type of inflorescence and arrangement of leaves. × ⅔.

2. A single flower. × 2.2.

3. A cluster of mature fruits, showing the twisting and the dehiscing in one side of the follicles. × ⅔. *s*, seeds.

4. A seed enlarged. × 1.6.

5. A photograph of fresh bark collected at Antipolo, Rizal Province, showing the uneven, rough, fissured character of the outer surface, with lenticel, *l*. × ⅔.

PLATE 2. ALSTONIA SCHOLARIS R. BROWN

FIG. 6. Photograph of bark bought in the market; *a*, *b*, dorsal views; *c*, transverse section; *d*, inner view, showing indentation. × ½.

7. Photograph of another sample bought in the market, representing type of bark collected from branches; *a*, outer surface, showing longitudinal fissures and the transversally elongated lenticels, *l*; and *b*, inner surface with indentation. × ½.

8. A microphotograph of a section through the young phloëm prepared from material macerated with caustic potash; *lv*, laticiferous vessels; *co*, calcium oxalate crystals. × 50.

9. A microphotograph of a section through the tip of a very young stem macerated with caustic potash; *lv*, laticiferous vessels, showing method of branching. × 50.

10. Another microphotograph of a section through the young phloëm of younger bark, showing laticiferous vessels, *lv*.

PLATE 3. ALSTONIA SCHOLARIS R. BROWN

FIG. 11. A transverse section of very young bark before the formation of the phellogen layer, showing epidermis and outer part of cortex. × 330.

12. A transverse section through the epidermis and outer part of cortex from a young stem; the subepidermal cells have elongated and divided; the outer layer becomes cork cells and the inner one the phellogen layer, *ph*. × 330.

13. A transverse section through the epidermis and outer part of cortex from a young stem, showing the two layers of cells produced by the division of the phellogen; the outer layer remains as phellogen and the inner one becomes the phelloderm layer. × 330.

FIG. 14. A transverse section of the outer part of the bark, showing the second division of the phellogen producing another layer of cork cells toward the outside; *ph*, phellogen; *pe*, phelloderm.

15. Another transverse section through the outer part of young bark, showing additional cork cells formed by the activity of the phellogen, *ph*; *pe*, phelloderm. × 330.

16. A diagrammatic sketch of a transverse section of old bark, drawn under the camera lucida with ocular × 2 and objective 48 mm. *k*, periderm; *co*, calcium oxalate crystals; *lv*, laticiferous vessels. × 8.

17. A detailed transverse section of the periderm, indicating *k*, cork; *sc*, stone cells; *pe*, phelloderm cells; *co*, calcium oxalate crystals. × 100.

18. Outer portion of a transverse section of the cortical region; *co*, calcium oxalate crystals; *sc*, stone cells. × 100.

19. A portion of a transverse section from the inner part of the cortical region; *sc*, stone cells; *lv*, laticiferous tubes; *r*, medullary ray with starch grains; *co*, calcium oxalate; *p*, parenchyma. × 100.

20. A small portion of a transverse section of the bast; *r*, medullary rays; *bf*, bast fibers; *lv*, laticiferous vessels; *co*, calcium oxalate; *sg*, starch grains. × 100.

PLATE 4. ALSTONIA SCHOLARIS R. BROWN

FIG. 21. A transverse section of the innermost part of the young phloëm, showing a number of laticiferous vessels, *lv*; *r*, medullary rays; *co*, calcium oxalate.

22. A longitudinal section through the inner part of the stone-cell region, showing *sc*, stone cells; *r*, medullary rays; *co*, calcium oxalate; *lv*, laticiferous vessels. × 100.

23. A radial section near the young phloëm; *co*, calcium oxalate; *r*, pith rays; *p*, parenchyma cells; *lv*, laticiferous vessels. × 100.

24. A radial section through the young phloëm, showing *st*, sieve tubes; *sp*, a series of sieve plates; *lv*, laticiferous vessel; *co*, calcium oxalate; *r*, pith rays. × 100.

25. A crystal fiber from the young phloëm. × 196.

26. A bast fiber from material bought in the market, as indicated in Plate 2, fig. 7; *c*, cup of cellulose. × 64.

27. A bast fiber from macerated material bought in the market, as indicated in Plate 2, fig. 7; *c*, cup of cellulose. × 64.

28. A bast fiber isolated from the fresh bark of a small branch from Antipolo, Rizal Province. × 64.

29. A group of starch grains from medullary rays of fresh bark. × 385.

PLATE 5. ALSTONIA SCHOLARIS R. BROWN

FIG. 30. A group of laticiferous vessels dissected from the young phloëm of fresh bark macerated with caustic potash; *lb*, branch of laticiferous vessel. × 45.

31. A group of laticiferous vessels dissected from the outer part of the young phloëm between the stone cells, of fresh bark macerated with potash. × 45.

FIG. 32. A laticiferous vessel dissected from the very tip, near the node of a young stem, showing method of branching. × 45.

33. A group of laticiferous vessels drawn from a macerated section of the midrib of a nearly mature leaf. × 45.

34. A branching laticiferous vessel isolated from fresh bark of a two- to three-year-old branch. × 45.

35. A tip of a laticiferous vessel, *lv*, showing its relation with the surrounding parenchyma cells; *co*, calcium oxalate. × 126.

36. A branching laticiferous vessel taken from the youngest node at the tip of a stem. × 55.

37. A branching laticiferous vessel prepared from the node at the tip of a young stem, showing two of the small branches pointing downward. × 55.

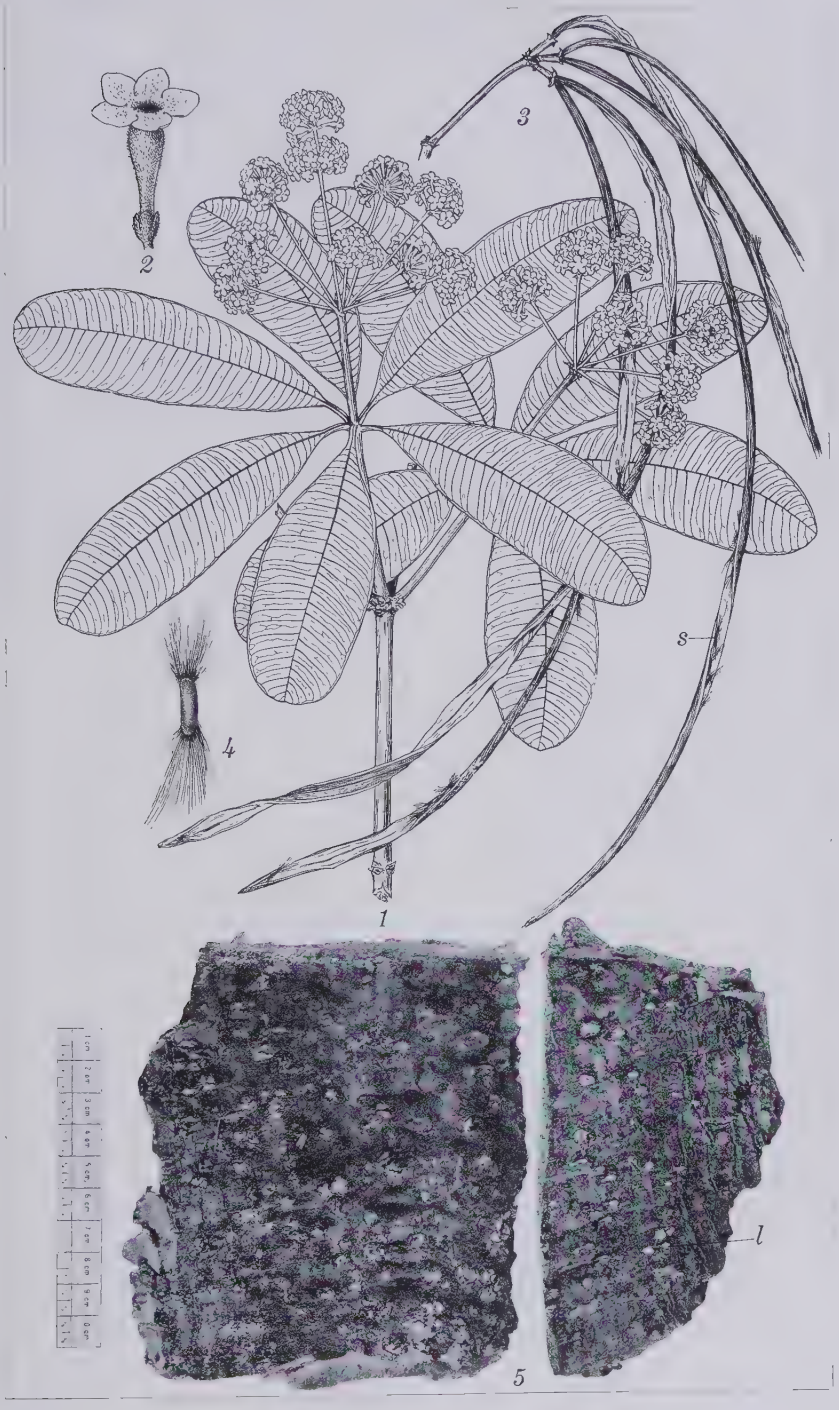
38. A tip of a branch of a laticiferous vessel, *lv*, showing the more or less spiral characteristic, like the tip of a screw. × 126.

PLATE 6. ALSTONIA SCHOLARIS R. BROWN

FIG. 39. A group of stone and sclerenchyma cells isolated from fresh bark by means of Schulze's method. × 67.

40. A group of stone and sclerenchyma cells from material bought in the market, as represented in Plate 2, fig. 6. × 67.

41. A group of stone and sclerenchyma cells from material bought in the market, as represented in Plate 2, fig. 7. × 67.



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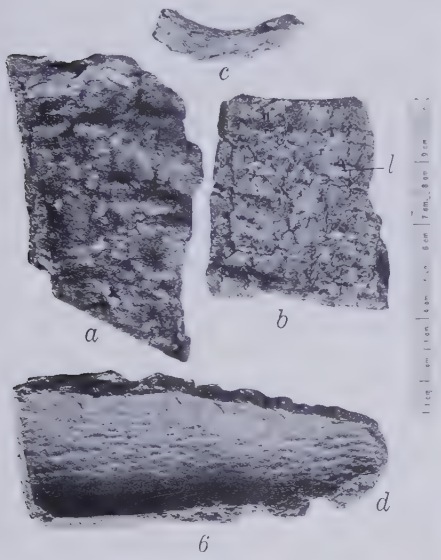

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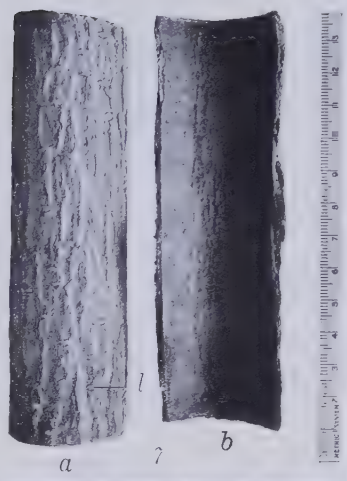

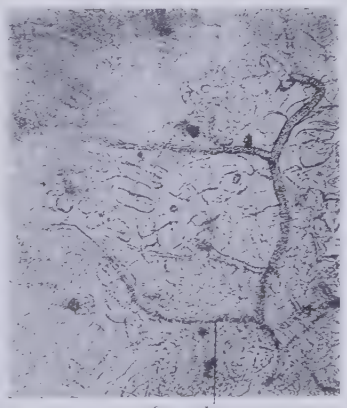

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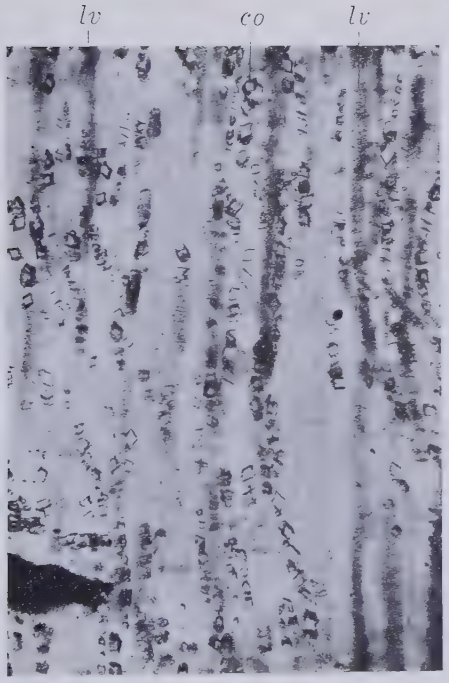

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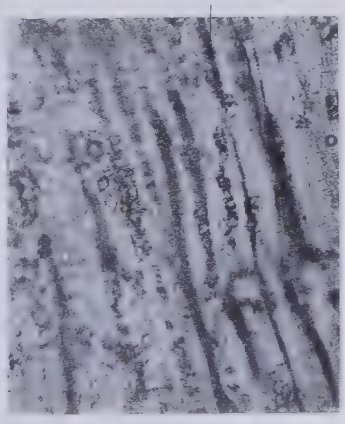

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PLATE 2.

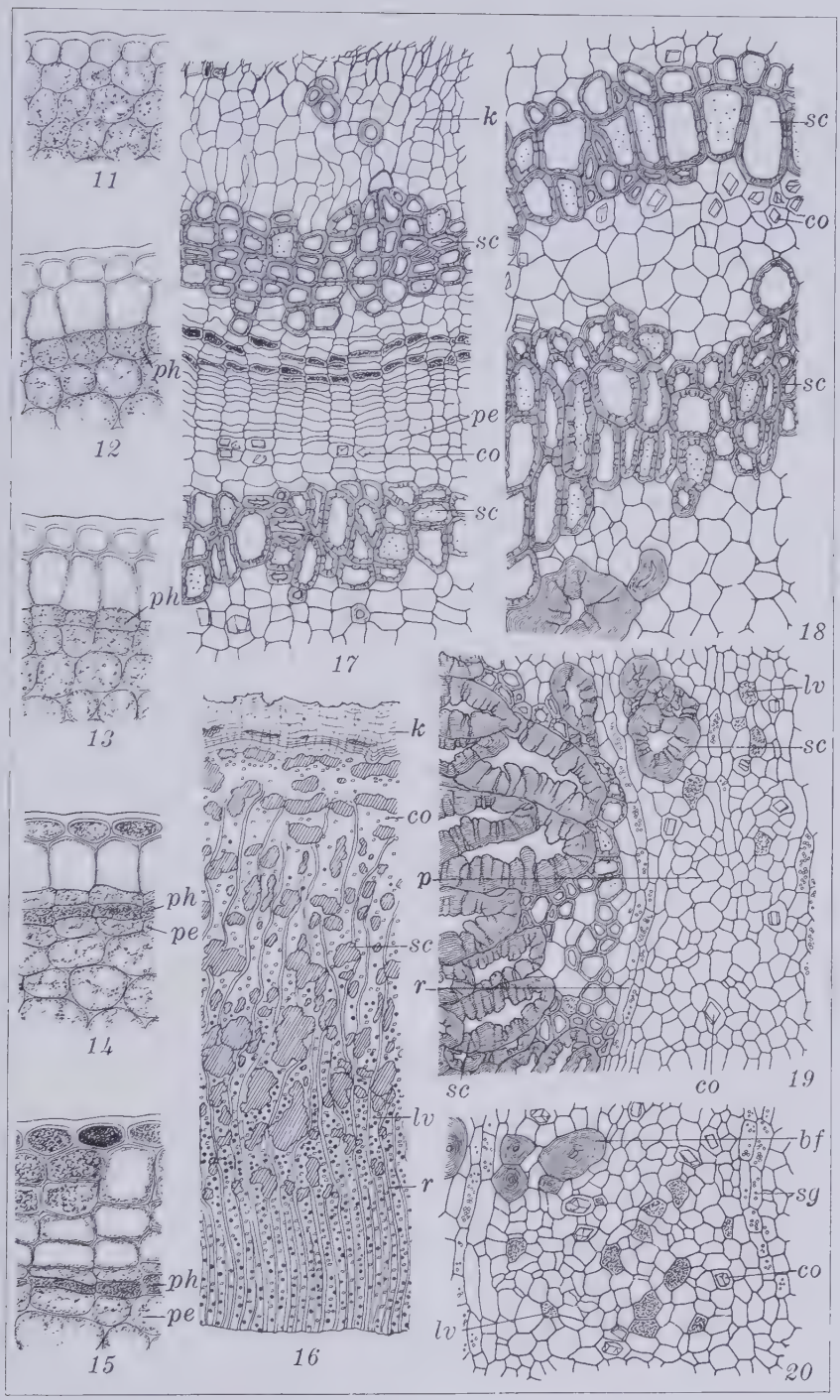
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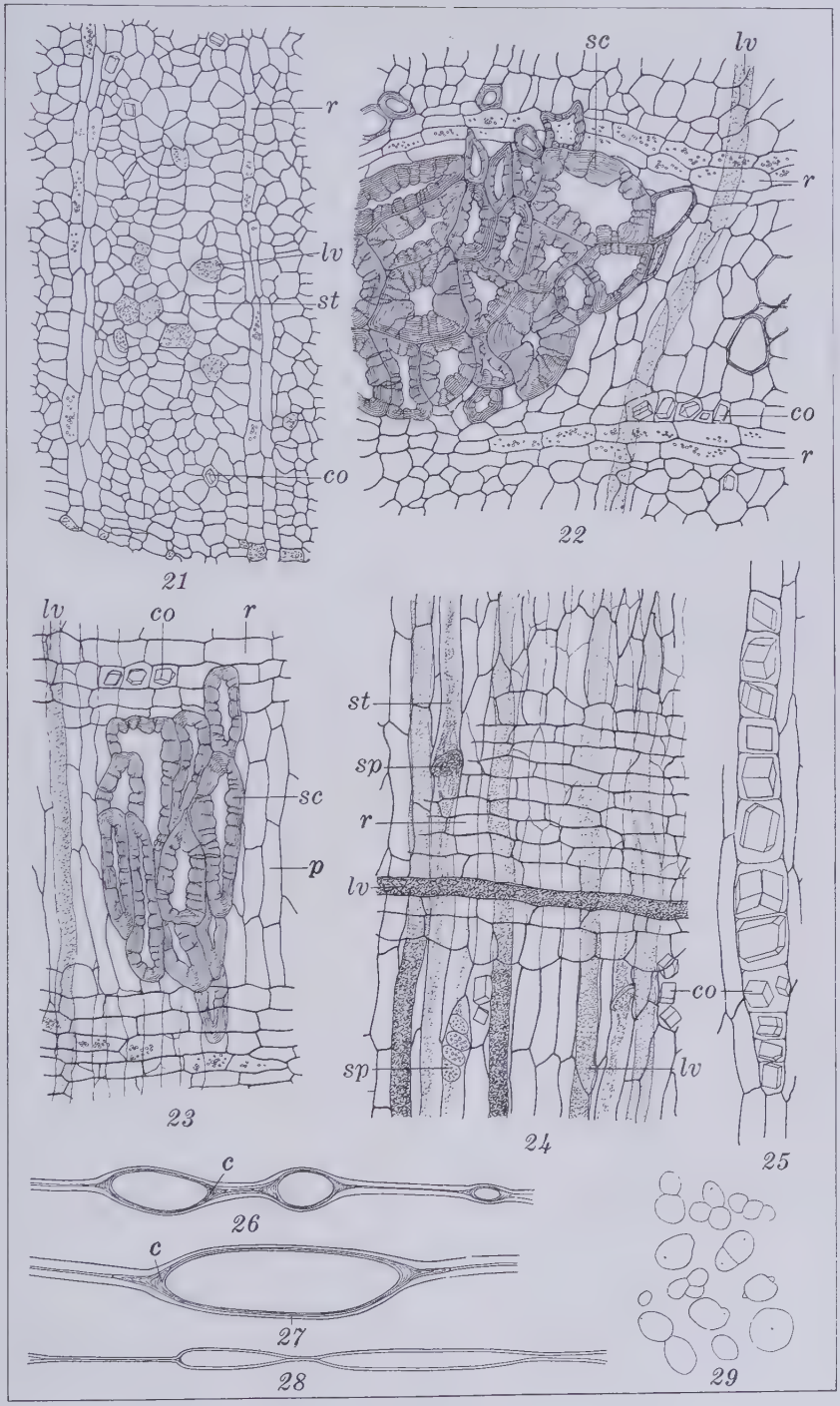
PLATE 3.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21
sc
lv
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22
lv
co
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co
25
c
26
c
27
28
29

PLATE 4.

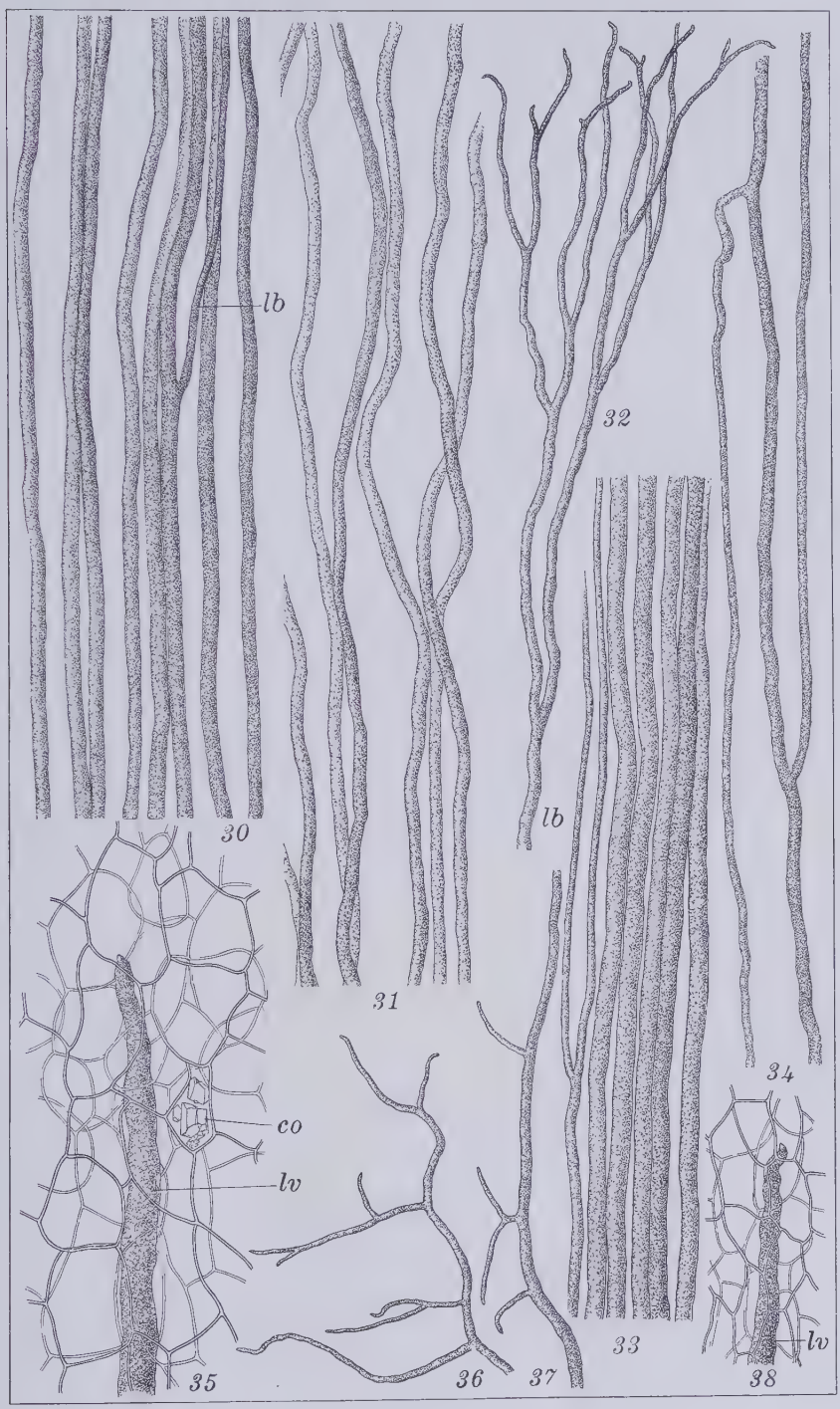

PLATE 5.

PLATE 6.